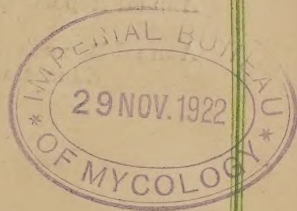


*Imperial*  
**DEPARTMENT OF AGRICULTURE  
FOR THE WEST INDIES.**



**REPORT**  
ON THE  
**AGRICULTURAL DEPARTMENT  
DOMINICA,**

**1921-22.**



**BARBADOS.**

**ISSUED BY THE IMPERIAL COMMISSIONER OF AGRICULTURE  
FOR THE WEST INDIES.**

**1922.**

**[Price Sixpence.]**



**REPORTS**  
**ON THE**  
**BOTANIC STATION, ECONOMIC**  
**PLOTS, AND AGRICULTURAL**  
**EDUCATION, DOMINICA.**

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**Annual Reports on Certain Economic Experiments conducted in connexion with the Botanic Station, 1900-2.**

**Annual Reports on the Botanic Station for the years 1901 and 1902.**

**Annual Reports on the Botanic Station, Economic Experiments, and Agricultural Education for the years 1902-3 to 1921-22.**

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*IMPERIAL*  
*DEPARTMENT OF AGRICULTURE*  
*FOR THE WEST INDIES.*



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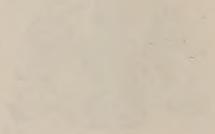
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1922.

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[Price Sixpence.]

IMPERIAL  
DEPARTMENT OF AGRICULTURE  
FOR THE WEST INDIES



REVENUE  
OF THE  
AGRICULTURAL DEPARTMENT  
DOMINICA

ORDER OF THE SECRETARY, DEPARTMENT OF AGRICULTURE  
FOR THE WEST INDIES

(Signed) Secretary

## LETTER OF TRANSMITTAL.

---

*Commissioner of Agriculture—to Administrator, Dominica.*

August 23rd, 1922.

Sir,

I have the honour to forward the Report on the Agricultural Department, Dominica, for the year ended March 31, 1922.

2. As well as recording work done in the Botanic Gardens and Experiment Stations, this report contains useful and suggestive sections by Mr. Jones on the development of new and existing industries in the Presidency.

3. Incorporated also will be found important mycological and chemical information derived from special work done in aid of Dominica by the Federal and Imperial Departments of Agriculture.

4. Altogether the report is one of great interest and value. It clearly shows that agricultural matters in Dominica, during the year under review, have received a large amount of thought and technical investigation.

I have, etc.,

(Sgd.) FRANCIS WATTS

Commissioner of Agriculture  
for the West Indies.



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# STAFF OF THE AGRICULTURAL DEPARTMENT, DOMINICA.

|                       |                                                                                              |
|-----------------------|----------------------------------------------------------------------------------------------|
| JOSEPH JONES ... ..   | Agricultural Superintendent and<br>Curator of the Botanic Gardens<br>and Experiment Station. |
| ALFRED KEYS ... ..    | Assistant Curator.                                                                           |
| F. J. BAPTISTE ... .. | Foreman.                                                                                     |
| W. G. HUTTON ... ..   | Clerk.                                                                                       |
| D. A. GREEN ... ..    | Overseer.                                                                                    |

## REPORT ON THE AGRICULTURAL DEPARTMENT, DOMINICA,

For the Year ended March 31, 1921

### WORK IN THE GARDENS AND OBSERVATIONS ON PLANTS.

From a cultural point of view, the work carried on in the Gardens and Experiment Station continues on sound lines. The importation of plants, chiefly economic in character, for experimental cultivation adds yearly to the already large and valuable collection of useful species which occupies the best parts of the Gardens, so much so, that it is now difficult to find good positions for new arrivals. Happily, the starting of an Experiment Station a few years ago provided additional areas for plot experiments, and made it possible to grow on a fair scale, such economic plants as Camphor, Shea Butter, new varieties of Citrus, Coconuts, Oil Palms and other species of importance, for which no room existed in the main institution.

The experiment plots in the Botanic Gardens which consist of Cacao, Nutmegs, Vanilla, various Citrus, Coffee, Cola, Rubber, etc., have as usual, been maintained in a healthy condition. The cacao manurial plots which occupy several acres of land, after being carried on without interruption for a period of twenty years, are about to be brought to a close, and a new series based largely upon the experience gained, will commence. As there will be no control plots in the new series, and as the application of manures will also be on a more liberal scale than in the old experiments, it is only reasonable to expect, in coming years, an increase in the output of this product, which, during times of normal prices contributes so considerably towards the upkeep of the Agricultural Department.

The position in regard to cultivation at the Experiment Station is also favourable. The crop yield during the year under review was close upon 2,500 barrels of limes from about 10 acres of land. Adjacent to the present bearing plots is a sufficient acreage of young limes about to come into bearing which will double the above output in a few years. At the present time another piece of land five acres in extent, awaits draining and planting in order to bring the cultivation under limes to about twenty-five acres. Once such an area is established, the crop in normal years, should, given the right conditions, contribute very considerably towards the maintenance of the Department.

While the position is satisfactory as regards cultivation and development work, the reverse is the case in all matters of Departmental equipment. This is

## IMPORTATION AND DISTRIBUTION OF PLANTS.

due to the existing depression and consequent financial stringency. Further, under present conditions, it is not possible to make provision for a lime factory which is needed at the Experiment Station. In the absence of a factory, the crop, as at present, must continue to be carted to the Bath Estate for sale, a distance of about a mile. That part of the public road running through the Experiment Station is in an execrable condition, and funds cannot now be found to build the necessary culverts, and to macadamize the surface in order to make a road usable for carting under all conditions of weather. Neither can a sound system of transport capable of moving 5,000 barrels of limes be provided until a good road is made. Under such conditions it is evident that much loss of crop may result, and any good that may be derived from the maintenance of an Experiment Station will relate to cultural methods and to results of manures applied, and will not, owing to lack of facilities, be backed by those monetary results which should confirm sound experiment work with orchard cultivation.

Amongst the more interesting plants established in the Gardens recently may be mentioned *Cassia Sieberiana*, native to Nigeria, a fine flowering tree and a welcome addition to this class in the Gardens. This species requires a good situation and by no means easy to establish. Another interesting introduction is the Hunterman's Nut of Trinidad, (*Onphalea Megacarpa*), which yields a nut with a pleasant taste, closely resembling that of Brazil Nuts. As this species is a trailer it has been planted at the base of a Saman tree, near by which is growing its already established congener, *Onphalea triandra*. Seeds of an Indian shade tree (*Putranjiva Roxburghii*) were obtained and a healthy batch of seedlings raised. This species was introduced some years ago and failed to succeed. It is hoped that better results will follow the present attempt to establish this tree.

Mention was made in the last Progress Report of a fine palm in the Gardens which was indistinguishable from the Cohune Palm, (*Attalea Cohune* Mart.) until the fruiting stage began. Flowers and seeds of this remarkably fine palm were despatched to the Director, Kew Gardens, at which institution it was identified as *Scheelea excelsa*, Barb. Rodr. Non. Karst.

Of the new ornamental plants which flowered in the Gardens for the first time, reference must be made to the large fine inflorescence of *Brownea kewense*, and the very striking flowers of the strong growing climber, *Congea tomentosa*. In the economic section, the Rambutan (*Nephelium lappaceum*) reached the flowering stage.

## WORK IN THE NURSERIES AND DISTRIBUTION OF PLANTS.

Plant distribution during the current period has fallen very considerably below the figures of last year, and with the exception of the distribution in 1898, which was 20,000, compares very unfavourably with any previous record.

The number of lime plants sent out during the year shows a decrease of over 13,000 compared with the year 1920-21.

This falling off in the distribution of lime plants indicates very clearly that development work has more or less come to a standstill: a condition unquestionably due to the depressed state of the market in regard to lime products.

For similar reasons the number of cacao plants sold during the year shows a considerable decrease.

## IMPORTATION AND DISTRIBUTION OF PLANTS.

The number of plants sent out during the year was as follows :—

|                                 |     |     |     |               |
|---------------------------------|-----|-----|-----|---------------|
| Limes                           | ... | ... | ... | 19,982        |
| Budded Washington Navel oranges | ... |     |     | 242           |
| „ Grape fruits                  | ... | ... |     | 81            |
| „ Limes                         | ... | ... | ... | 13            |
| „ Portugal oranges              | ... | ... |     | 20            |
| „ Tangerines                    | ... | ... |     | 21            |
| „ Sweet limes                   | ... | ... |     | 17            |
| Grafted mangoes                 | ... | ... |     | 23            |
| Cacao                           | ... | ... | ... | 75            |
| Vanilla                         | ... | ... | ... | 525           |
| Nutmegs                         | ... | ... | ... | 20            |
| Mangosteens                     | ... | ... | ... | 8             |
| Camphor                         | ... | ... | ... | 120           |
| Pois doux                       | ... | ... | ... | 250           |
| Miscellaneous                   | ... | ... | ... | 183           |
| Total                           |     |     |     | <u>21,575</u> |

The following supply of Miscellaneous seeds, seedlings and cuttings was also distributed :—

|                        |     |     |               |
|------------------------|-----|-----|---------------|
| Vegetable seeds        | ... | ... | 2,015 packets |
| Onion seedlings        | ... | ... | 15,900 No.    |
| Sugar cane cuttings    | ... | ... | 14,050 „      |
| Shade tree cuttings    | ... | ... | 1,130 „       |
| Horse Beans            | ... | ... | 10 lb.        |
| Tephrosia Candida seed | ... | ... | 8 „           |

## PLANT IMPORTATIONS.

Mahwa tree (*Bassia latifolia*): A few seeds of this species were received from India, and, germinated; but the plants were difficult to rear, and a number were lost in the seedling stage. Two specimens have been planted out and at the time of writing, are healthy and promising.

This well known Indian tree yields sweet tasted flowers which are used as food and also for the production of spirit. The seeds yield an oil. It is hoped this interesting tree will be found to succeed in Dominica.

Seeds of the Marang (*Artocarpus odoratissimus*), a fruit tree of the Philippine Islands, and the Rambai (*Baccaurea Motleyana*), a fruit tree native to the Malay Peninsula, were received from the Director, Agricultural Department, Kuala Lumpur, but all failed to germinate. Arrangements have been made through the good offices of Kew to secure seedlings of the Marang from the East for trial in Dominica, while further efforts will be made to introduce the Rambai. The successful introduction and naturalisation of these trees would add greatly desired species to the already large collection of fruit trees in these Gardens.

A few persons in Dominica find considerable interest in growing a plant or two of the grape vine near to their houses in order to obtain a supply of this popular fruit, and in some cases the plants do remarkably well. It is obvious that success depends upon the variety grown, and, as the English hot house varieties do not appear to be suited to West Indian conditions, cuttings of the kinds which do well in Florida and Cuba have been obtained from the United States Department of Agriculture for experiment in this connexion. This opens up an interesting line of work, for much would need to be done in testing varieties and in conducting trials with stocks before any considerable success could be achieved and the work placed upon a knowledgeable basis. Nevertheless it is hoped that time will be available to allow of some work being undertaken in this direction.

Through the initiative of the Imperial Department of Agriculture, eighteen seed coconuts,--six each of three dwarf varieties--were received from the Director of Agriculture, Federated Malay States, for trial in Dominica. Four of each variety were successfully germinated and these are about to be planted out. Four seed nuts of the well known "San Ramon" variety were imported from the Philippines by way of Kew Gardens, but on arrival two were found to have sprouted and died back during transit. The remaining two failed to grow.

Later in the year two varieties of nuts were received from the Malabar Coast, Southern India, under the names of Nicobar and West Coast Green. None of these has shown germination results up to the time of writing.

Seeds of selected varieties of the Oil Palm (*Elaeis guineensis*) have been obtained and a healthy batch of plants raised. These will be grown experimentally on estates with a considerable rainfall as this species does not thrive well in the Botanic Gardens, in which place the rainfall is apparently insufficient for the proper development of this valuable palm.

Elephant grass (*Pennisetum purpureum*) was introduced and distributed to several estates. This should prove a useful addition to our list of fodder grasses and also a desirable plant for providing mulches for lime and other cultivations

## NOTES ON ECONOMIC PLANTS.

### CACAO.

#### GRAFTED CACAO.

A note on the three plots of grafted cacao trees and their yields appeared in the report for 1915-16. These experiments—probably the first of their kind—were started 16 years ago with the object of ascertaining the value of grafted trees as early and heavy bearers. The yields, which have been carefully recorded, are now brought up to date in the tables below :

#### PLOT 1.

| Date of Planting. | No. of Trees<br>Planted. | Last date of<br>Picking. | No. of<br>Bearing<br>Trees | Total Annual<br>yield in Pods | Yield Per<br>Tree in Pods |
|-------------------|--------------------------|--------------------------|----------------------------|-------------------------------|---------------------------|
| July 1906         | 14                       | June 30, 1908            | 14                         | 12                            | 0.8                       |
| " 1907            | 14                       | " " 1909                 | 14                         | 237                           | 16.9                      |
| " Total           | 28                       | " " 1910                 | 28                         | 860                           | 30.7                      |
|                   |                          | " " 1911                 | 28                         | 1,382                         | 49.3                      |
|                   |                          | " " 1912                 | 28                         | 1,365                         | 48.7                      |
|                   |                          | " " 1913                 | 28                         | 1,274                         | 45.5                      |
|                   |                          | " " 1914                 | 28                         | 2,360                         | 84.3                      |
|                   |                          | " " 1915                 | 28                         | 3,558                         | 126.0                     |
|                   |                          | " " 1916                 | 28                         | 2,702                         | 96.5                      |
|                   |                          | " " 1917                 | 28                         | 3,308                         | 118.1                     |
|                   |                          | " " 1918                 | 28                         | 3,265                         | 116.6                     |
|                   |                          | " " 1919                 | 28                         | 3,138                         | 112.0                     |
|                   |                          | " " 1920                 | 28                         | 3,899                         | 139.2                     |
|                   |                          | " " 1921                 | 26                         | 2,875                         | 110.5                     |
|                   |                          | " " 1922                 | 26                         | 2,699                         | 103.8                     |

The trees in plot 1, numbering 28, consist of 14 each of the Forastero, and Criollo types. Half of the trees were planted in 1906, and the other half in 1907.

It will be seen from the above table that the full number of trees (28) came into bearing in 1910. The trees in this plot were originally planted amongst orange trees. In 1912-13 the yield being to fall off, but showed a considerable increase in crop in 1914 and 1915, after the removal of the orange trees, started in

1913, had been completed. During 1916, owing probably to the excessive rains and high winds there was a falling off in the yield. Since that time some recovery is noticeable. This plot has received an annual dressing of pen manure.

### PLOT 2.

| Date of Planting. | No. of Trees<br>Planted. | Last date of<br>Picking. | No. of<br>Bearing<br>Trees. | Total annual<br>yield in Pods. | Yield per<br>Tree in Pods. |
|-------------------|--------------------------|--------------------------|-----------------------------|--------------------------------|----------------------------|
| July 1907         | 35                       | June 30, 1910            | 25                          | 191                            | 5.4                        |
| „ 1908            | 17                       | „ „ 1911                 | 52                          | 893                            | 17.1                       |
| Total             | 52                       | „ „ 1912                 | 52                          | 3,466                          | 66.6                       |
|                   |                          | „ „ 1913                 | 52                          | 6,466                          | 124.3                      |
|                   |                          | „ „ 1914                 | 52                          | 7,782                          | 149.3                      |
|                   |                          | „ „ 1915                 | 42                          | 3,579                          | 85.2                       |
|                   |                          | „ „ 1916                 | 42                          | 4,038                          | 96.1                       |
|                   |                          | „ „ 1917                 | 42                          | 4,774                          | 113.6                      |
|                   |                          | „ „ 1918                 | 50                          | 5,053                          | 101.0                      |
|                   |                          | „ „ 1919                 | 50                          | 5,965                          | 119.3                      |
|                   |                          | „ „ 1920                 | 50                          | 6,588                          | 131.7                      |
|                   |                          | „ „ 1921                 | 50                          | 5,537                          | 110.7                      |
|                   |                          | „ „ 1922                 | 52                          | 6,058                          | 116.5                      |

The trees in plot 2 are of the Forastero type. Thirty five were planted in 1910 and 17 the following year, bringing the total number of trees up to 52 in 1911.

The trees are planted at distances of 12ft. x 12ft. They were severely attacked by root grubs during 1914, and several trees were killed outright. These were replaced and the number of bearing trees is now fifty-two. This plot suffered considerably during the hurricane of 1915 and 1916. Unlike plots 1 and 3, plot 2 has not been systematically manured; had this been done, the unfortunate attack of root grubs during 1914 might not have occurred. Since 1916 these trees have received a liberal application of nitrogen, phosphate and potash each year.

Planters would do well to remember that any efforts to increase the yield per acre by selecting and grafting good bearing varieties, or rather varieties capable of bearing if they receive adequate supplies of plant food, must be followed up by a sound system of manuring and by good cultural operations. If these are lacking, the trees, as in the above instance, are likely to overbear themselves, and then being in a weakened state, fall prey to the attacks of their insect or fungus enemies. The act of selecting and grafting is the first step in the direction of increasing the yield per acre but it is doubtful if this object will be attained over a series of years, unless intensive methods of cultivation are applied.

## LIME JUICE PRODUCTS.

## PLOT 3.

| Date of Planting. | No. of Trees<br>Planted. | Last date of<br>Picking. | No. of<br>Bearing<br>Trees. | Total annual<br>Yield in Pods. | Yield per<br>Tree in Pods. |
|-------------------|--------------------------|--------------------------|-----------------------------|--------------------------------|----------------------------|
| July 1910         | 30                       | June 30, 1914            | 30                          | 713                            | 23·7                       |
|                   |                          | „ „ 1915                 | 30                          | 1,239                          | 41·3                       |
|                   |                          | „ „ 1916                 | 30                          | 1,763                          | 58·7                       |
|                   |                          | „ „ 1917                 | 30                          | 2,609                          | 86·9                       |
|                   |                          | „ „ 1918                 | 30                          | 2,702                          | 90·0                       |
|                   |                          | „ „ 1919                 | 30                          | 2,857                          | 95·2                       |
|                   |                          | „ „ 1920                 | 30                          | 3,371                          | 112·4                      |
|                   |                          | „ „ 1921                 | 30                          | 3,263                          | 109·0                      |
|                   |                          | „ „ 1922                 | 30                          | 3,024                          | 100·8                      |

Plot 3 consists of 30 trees of a Forastero variety planted at 20ft. x 20 ft. amongst seedling oranges. The comparatively low yield of this plot and plot 1 during the first six years of the experiment, was undoubtedly due to the presence of the seedling orange trees. The orange trees in plot 3 have been gradually removed, but a few still remain.

## THE CHIEF INDUSTRY.

## LIME JUICE PRODUCTS.

## GENERAL CONDITIONS.

The crop shipped during 1921 was a record one. Calculated, as usual, in barrels of a capacity of 4·55 cubic feet, the produce exported represented 516,193 barrels of fruit, or 114,000 barrels over the record output of 1919, when the crop amounted to 402,000.

In the case of crop records such as limes and cacao, adherence to the calendar year as a measure of output, by no means reflects the actual situation. The use of the calendar year for this purpose provides a record of the shipments during the period, but the figures given in each case do not represent the annual yields, owing to the considerable time which elapses between the gathering of the limes and shipment of the prepared product. In consequence of this, the year 1920, which was the best year as regards production ever experienced in Dominica, takes a low place on the annual returns, while 1921, an indifferent year as regards yields, breaks all records. This is entirely due to the carry over, always considerable, and occasionally very large, at the end of each calendar year. A fairly accurate return of each crop could be obtained by taking a twelve month period ending June 30 as the crop year, by which time shipments, generally speaking, are completed. The effect of the climate and rainfall, and of general conditions on the annual yield could then be studied with advantage in relation to each period.

## LIME INDUSTRY.

While the shipments were very satisfactory as regards quantity, the year 1921, owing to the depressed state of the market, was an exceedingly unprofitable one, and it will long be remembered by planters as a very difficult and trying period.

The lime crop for the past five years calculated in barrels of fruit is recorded below :--

|      |     |     |         |
|------|-----|-----|---------|
| 1917 | ... | ... | 396,000 |
| 1918 | ... | ... | 318,000 |
| 1919 | ... | ... | 402,000 |
| 1920 | ... | ... | 369,000 |
| 1921 | ... | ... | 516,000 |

The following table, calculated on the usual basis\* shows the disposal of the crop under the following heads :--

| Product.           |     |     |     | Barrels of fruit. | Approximate percentage of total crop. |
|--------------------|-----|-----|-----|-------------------|---------------------------------------|
| Concentrated juice | ... | ... | ... | 341,574           | 66.2                                  |
| Raw juice          | ... | ... | ... | 11,975            | 2.9                                   |
| Fresh limes        | ... | ... | ... | 21,883            | 4.2                                   |
| Citrate of lime    | ... | ... | ... | 137,362           | 26.6                                  |

Comparison with the figures of last years' disposal of crop shows the following changes. The proportion shipped as concentrated juice rose from 62 to 66.2 per cent, and that shipped as raw juice fell from 10 to 2.9 per cent. Fresh limes showed a slight fall from 5 to 4.2 per cent. Citrate of lime continued to improve its position, having risen from 22 to 26.6 per cent. The small business in pickled limes was represented by 399 barrels of fruit. No shipments of lime juice cordial were made during the year.

The planters of Dominica are often reproached by writers and others for their almost complete dependence upon a single industry. But while it is quite true that the welfare of the island depends largely upon a single species of plant, the fact that the fruit of the tree produces no less than eight products, six of which are of importance, is often overlooked. While the lime is grown primarily for the production of citric acid, which is always likely to be the chief product, the industry, to the present, has been stabilised by the development of important lines of business in raw juice, fresh limes, and essential and distilled oils. Thus, as often happened, while the market for one or more products was in a depressed state, other products were selling at satisfactory rates, and what might have been a period of depression was successfully weathered by the existence of these varied conditions.

Viewed in this light the above percentage table does not make pleasant reading. The gradual falling away, almost to vanishing point, of the trade in raw juice and fresh limes is unfortunate. During 1914, under normal conditions, these two products formed no less than 24 per cent. of the industry, in 1916, 30 per cent, though the latter figure was due in some measure to war conditions. During the year under review, these once flourishing trades formed only 7.1 per cent of the entire production of limes, while the citric acid trade as represented by concentrated lime juice and citrate of lime, made up the balance of 92.8 per cent.

It will be seen that while the output of limes is increasing, the tendency is towards the extinction of certain lines of trade in lime products, which, in the past, have given a large measure of stability to the lime industry. It is regrettable that while production is increasing, the general drift should, by force of circumstances, be narrowing in the direction of a single product, that is, a citric acid industry, rather than towards the more desirable and wider basis of business which the interests of planters and the well being of the island alike require.

\*50 gallons of concentrated juice represents 75 barrels of lime fruits: 7½ gallons of raw juice represents 1 barrel of lime fruits: 1 ton of citrate of lime is equivalent to 266 barrels of lime fruits.

## LIME JUICE PRODUCTS.

Mention was made in the last Progress Report of the erection of a factory at the Bath Estate by the firm of L. Rose & Co. Ltd., for the production of citric acid crystals. The plant was completed towards the close of the year and a small shipment of citric acid weighing 224 lb. and valued at £10 was made in December. Early in January, 1922, a second shipment of a weight of 8,260 lb. and valued at £415 was effected. Both of these consignments successfully passed the analyst's tests, and were favourably reported upon.

This is probably the first time that citric acid has been produced on a commercial scale in a British Tropical Colony, and much credit is due to Messrs. L. Rose & Co., Ltd. for their enterprise and achievement.

The starting of a citric acid factory by a private firm aroused considerable interest, and the question arose as to whether a combine of growers could succeed in raising funds for the erection of a second factory on the co operative principle, for making the finished product locally, instead of, as now, shipping the raw material. The matter was investigated by a committee of planters, and acting on the information collected from various sources—which proved a liberal education in respect to the working costs and the manufacture of citric acid, and also on its disposal in the English and foreign markets—it was finally decided not to proceed with this matter until the general outlook became clearer and more hopeful.

In this connexion it may be interesting for planters to learn that citric acid is used, in the United Kingdom, chiefly in the following trades: Dyeing, Calico Printing, the manufacture of Health salts, Mineral waters, Medicinal preparations, Confectionery, and Sweetmeats.

Another development of interest was the erection of a factory for the production of citrate of lime at Blenheim Estate, one of the properties of Messrs. Rowntree & Co. Ltd. There are now four of these factories in operation in the island.

The weather conditions were again favourable. The rainfall was below the average and well distributed. High winds were experienced on the night of the 8th and during the 9th of September, but without doing any appreciable damage to agricultural interests.

There was also some improvement in the labour market. The shortage of labour, at one time acute, owing to the departure of many able bodied men for Cuba and other countries, is gradually being overcome, and matters in this direction are distinctly improving.

The position of the lime industry during 1921 is recorded in the following table:—

| Product.                | Quantity.       | Value.<br>£    |
|-------------------------|-----------------|----------------|
| Concentrated Lime juice | 227,716 gallons | 76,854         |
| Raw Lime juice          | 112,317 „       | 8,424          |
| Green Limes             | 21 883 barrels  | 30,566         |
| Pickled Limes           | 399 „           | 419            |
| Citrate of Lime         | 10,328 cwt.     | 38,558         |
| Citric Acid             | 2 „             | 10             |
| Essential oil of limes  | 51,574 lb.      | 6,921          |
| Otto of limes           | 18,551 lb.      | 15,056         |
|                         |                 | <u>176,808</u> |

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## MINOR INDUSTRIES.

The history of minor cultivations in Dominica is a depressing one. Owing to the development of the lime industry, which with one or two exceptions, has absorbed the whole attention and the capital of planters, but little interest has been accorded to minor industries, with the result that the position in respect to the latter is now much less favourable than it was fifteen years ago.

---

### CACAO.

Following a long way after the lime industry, the value of the several products of which amounted to the considerable sum of £176 800 is the comparatively small business in cacao. Of this product 6,764 cwt. of a value of £12,628 were shipped this amount being a little more than half of the average export during the early years of this century. There is no doubt that the hurricanes of 1915 and 1916 dealt a severe blow to cacao cultivation from which it has not recovered, and since those dates, there has been little encouragement to growers for renewed action in this respect owing to low market prices, and the very uncertain future, due to rapid development of planting and the enormous output of this product from the British West African Colonies.

Difficult as has been the situation during recent years it would still appear that efforts should be made by both planter and peasant to maintain, and if possible, to increase the cacao output in this island. There are many reasons for this view, chief amongst which is the present almost complete dependence upon the lime industry. There is also the stern necessity of doing all that is possible to broaden the foundations of the more promising of our minor industries. Again cacao is a food product of which there is a fairly large consumption in the island. It possesses the great advantage of being readily prepared for market on a small scale without the need of any very expensive apparatus either for fermenting or drying. It has been largely grown by the peasants during several generations and this class understands the special requirements of the tree as regards selection of suitable land and the need of protection, together with a sound knowledge of the varieties suited to the climatic conditions of Dominica, so that no expensive mistakes will be made under these heads. Once established, the cost of growing and the collection and curing of the crop is low when compared with a number of other tropical products, and when dried it will keep in good condition for a reasonable time. In spite of recent depression, there has been, over a fairly long period, only one year 1920, during which cacao did not pay.

The small cacao industry of to-day must decline further unless new efforts are made. Each year sees a loss of some trees owing to disease and other causes, a course which will continue until little cacao is available for export. Only by planting new areas can the situation be saved. It is hoped that the peasants knowledge of this cultivation, which is such a valuable asset, will not be lost, and that renewed interest in cacao growing will soon become evident.

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### COCO-NUTS.

Another industry of considerable promise is the production of coconuts. In 1920, a year of high prices for this product, the number exported was 705 979 of a value of £7,364. During the year under review nuts to the number of 299,787 and of a value of £2,505 were exported. This considerable falling away was in all probability due to low prices, but the exports during 1920 show clearly the possibilities in this direction.

The coconut, like cacao, is also a food product of which there is a considerable local consumption. It is highly probable that the annual output is in the region of

## COCONUTS AND GINGER.

the million mark. With capital and energy there is no reason why in the course of time several millions of nuts should not be produced yearly, and what is now a minor, gradually turned into a major industry.

That coconuts do well and are a highly suitable crop for this island, that the plants stand more wind than any other cultivation without injury, and can be established at a less cost per acre than either limes or cacao, that it thrives and bears well in a variety of situations, are facts which have been repeated many times. Apart from its general suitability as a crop for Dominica, the produce either as nuts or in the form of copra will stand a certain amount of rough handling without injury, a point of some importance in a country in which it is difficult to get anything handled with reasonable care.

Coconuts thrive well in Dominica up to 1,500 feet elevation, but it naturally follows that when grown on a large scale planters with lands near to the coast are in a favoured position, as regards transport and in cost of production which are matters of importance especially when prices rule low.

Every planter and peasant with available land should plant an area in this crop. In the Windward District in which place estates are generally of a large acreage with only a small portion under cultivation, development work could be undertaken each year with crops other than limes. By such means the position of the planter would be greatly improved, his estate would become enhanced in value, and his hold on the land, often so insecure in the case of dependence on a single crop, would be strengthened.

In a memorandum issued by the local Agricultural Department some months ago, it was suggested that in cases in which considerable areas were planted in coconuts, the raising of sheep could also be carried on with advantage especially when the palms were between two and seven years of age, at which time there is usually a rich herbage covering the ground coupled with a certain amount of grateful shade. There is little doubt that the extension of coconut planting and the raising of sheep could proceed side by side with advantage to the planter, and with every prospect of effecting a gradual improvement in the agricultural conditions of Dominica.

## GINGER.

In the event of any sudden falling off in the lime crop, now unfortunately always a probability owing to the prevalence of insect and fungus diseases, the planter of Dominica, accustomed as he is to orchard cultivation would doubtless be glad to turn his attention to any annual crop that appears likely to offer a fair return on the annual outlay.

In this respect there can be no doubt that in ginger cultivation there is a possible industry well suited to the conditions of this island. There are considerable areas of cleared lands lying near to the forest, in the ownership of planters and peasants, which possess the necessary fertility, ample rainfall, and good general conditions needed for raising large crops of ginger, and if such an industry develops, these available lands could be greatly extended by felling the adjoining forest areas. Generally speaking, all round conditions for successful ginger cultivation in Dominica are first rate.

Though the possibilities in regard to ginger growing are considerable, planter well situated as regards land for this cultivation are at present without much interest, and certainly, in many instances, without the capital necessary to place a few acres of ground under this cultivation. The cost of preparing land for ginger and the keeping of the fields free of weeds until the rhizomes are ready to dig, is considerable, but the amount of crop raised should at fair market rates, prove remunerative to the growers. Again, peasants are not very much inclined to interest themselves in anything beyond their limes and cacao, their dasheen and other vegetables. The sale of the two first named gives them a little ready cash, and the latter furnishes the main food supply. On the whole, there is probably no peasant in the world who is happier and more free from care, and who

supports himself and family so easily as the small land owner of Dominica. While all this class grow a little ginger for domestic purposes, it would be difficult to get them to grow it in quantity unless there is some organization in existence which would be prepared to buy the green ginger for preparation and for shipment to markets abroad.

In order to encourage the growing of ginger in the first instance both by planters and by peasants, a central organization is needed on the co-operative principle, which would purchase the fresh ginger, prepare the grade that may be determined upon, in order to enable shipments of an even carefully prepared product to be made on a considerable scale. By such means a rapid development might be brought about. To start a successful industry of this kind in Dominica, it would be necessary that the grower should be able to dispose of his raw material at a rate to be fixed in accordance with market quotations, that he should be relieved of all work in connexion with the preparation and shipment of the produce, and that, at the end of the season he should receive his share of any profits earned by the Association. It cannot be too strongly pointed out that isolated efforts by a few growers resulting in small shipments of variously prepared ginger are not likely to help, but would in all probability serve to discredit and discourage any further efforts in this particular direction. The work of the Government Co-operative Lime Factory in St. Lucia in the development of lime growing, and the successful efforts of the Onion Growers' Association in Antigua, should be capable of being followed successfully in connexion with ginger cultivation in this island.

In the meantime in order to be prepared for eventualities, the need of possessing ample supplies of propagating material must be evident to all. Therefore all persons interested in this matter should see that plots of ginger are kept going on their estates and holdings for the purpose of planting larger areas should it be desired to do so.

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### VANILLA.

Another interesting cultivation which does not receive all the attention that it deserves is vanilla growing. This is not a cultivation that could be generally recommended in the absence of an expert in the curing of the beans, but such an expert has been present in the island for some years, and there is, at the proper season, a market for uncured vanilla beans which have been picked in the right condition.

There are so many opportunities of growing vanilla vines on suitable trees in a small way, or in the case of properly laid out cultivation, on tutors especially grown for this purpose, that it is rather remarkable so little has been done in this direction. Possibly the difficulty of getting healthy vines to flower sufficiently, and the need of pollinating the flowers, have proved a drawback, but how to overcome the former and how to effect the latter could be easily demonstrated at the Botanic Gardens to interested persons in the course of a few minutes.

Dominica possesses the advantage of a suitable climate for growing Vanilla together with the very great benefit of a resident expert in curing this product. Clearly now is the time to make an effort to lay the foundations of a vanilla industry.

In this connexion it may be mentioned that a large vanilla nursery has been maintained at the Botanic Gardens for many years past, and cuttings are available at any time in large quantities at merely nominal charges.

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### TOBACCO, ETC.

At the present time the growing of tobacco is also attracting some attention. Very interesting experiments have recently been carried out by Mr. W. A. D. Allport, which, it is hoped will be the starting point of further efforts on a larger

## THE FRUIT INDUSTRY.

scale. While much has to be learned in the growing and care of tobacco in the field, complete success is only won by a thorough knowledge of the curing process necessary for the variety grown and the type of tobacco to be turned out. This often means lengthy experiments involving considerable cash outlay. It is but seldom that the interest of amateur growers is sustained for a sufficient time to allow of success being won. Apparently the soundest method of starting tobacco cultivation in new localities is to introduce and subsidize one or two families who are experts in the growing and curing of this product.

In addition to the products mentioned above, there are a number of other crops now grown on a small which admit of further development. Amongst such are the bay oil industry, the growing of onions and ground nuts, the extension of the small nutmeg and cola nut cultivations, together with the possibility of giving more attention to honey production, and in the preparation of marmalade and jellies for export. There are plenty of opportunities for development in Dominica if capital and energy were only forthcoming to effect the necessary work.

## FRUIT GROWING

Apart from the products mentioned above, there is also the possibility of further developments in connexion with the small, but promising export trade in various fruits which is now carried on. During 1921, the quantities and values of fruits exported were as follows :—

|                              |               | Value  |
|------------------------------|---------------|--------|
| Bananas                      | 2,944 bunches | £221   |
| Mangoes                      | ... ..        | 1,036  |
| Oranges                      | 1,294 barrels | 776    |
| Avocados, Grape fruits, etc. |               | 238    |
|                              |               | £2,271 |

While much is possible in this direction in course of time a good deal of new planting would have to be done before any great progress could be recorded for although there are areas under grape fruits and other citrus of the best varieties which are available for export, a considerable extension of cultivation under selected varieties of mangoes and avocados would be needed before a really sound business could be brought about. Such fruit trees as those mentioned require several years to grow and bear fruit in quantities.

With regard to bananas, an official of the Canadian Government Mercantile Marine, Ltd. recently made enquiries as to whether a large number of bunches (20,000) could be guaranteed fortnightly, after allowing a year for planting and organization. No such supplies of bananas could be produced in Dominica in the time named, owing to lack of labour and capital to undertake work on such a scale. While, however, Dominica could not support a banana trade alone, this island, in due time, could join in a project of this kind if operated in all the islands from Trinidad and Tobago up to Dominica. With a producing area spread over so many islands damage caused by an occasional hurricane would not affect such an industry to any extent. Neither need much time be lost in loading, as the ships could steam between the islands during the night time.

Whether the islands referred to will ever support a banana industry is problematical. An immense amount of preliminary work would be necessary; planters would have to guarantee to place certain areas under this crop, and much propaganda would be needed amongst small growers in order to get them to assist. Then in Dominica there is the difficulty of bringing the heavy bunches of fruit, which have to be handled with great care, from the interior lands over bridle tracks to the coast. The presence of the dreaded Panama Disease in one of the

islands is a drawback, and much would depend on how the situation in this respect is handled. Nevertheless banana growing would be helpful to both planter and peasants so situated as to be able to take part in it. Further, if success came, it is probably the one industry likely to draw labour from other islands in order to settle and engage in this work.

Another matter on which much would depend is the variety of banana to be grown. For an island trade the Dwarf or Chinese banana is undoubtedly the best to plant, but whether this kind would be acceptable to the steamship carriers or to consumers in Canada is not clear.

Any efforts that may be made by powerful interests to establish a trade in bananas in the West India Islands would be welcomed in Dominica, in which place the need of developing minor cultivations or of establishing new ones becomes each day of more pressing importance.

During recent years some attention has been paid to the export of mangoes, chiefly to Bermuda. The value of these fruits shipped during 1921 amounted to £1,036. So far this business has been confined to seedling mangoes of little merit, and in no way comparable to the several grafted kinds which might be grown on some scale for export and on which a sound trade could be built up.

Recent experiments having shown that the "Julie" mango can be placed in New York and in Canada in first class condition, it is regrettable to find that sufficient trees of this variety are not in existence in the island to satisfy the local demand. That so little has been done in the way of planting high class fruit trees, has been a subject of comment in past reports. Undoubtedly there are reasons for this lack of interest, the chief one being the difficulty of obtaining the crop owing to the action of the bulk of the labouring population, who persist in regarding the produce of all fruit trees as being a communal, and not as being a private interest.

Still, planting on some scale would permit of more effective measures being taken in the way of protection. The "Julie" and other good types of grafted kinds could be largely grown in the coastal districts, and in all probability would prove a highly profitable undertaking. So far, there is nothing in the way of mango cultivation to be seen in the island; only in a very few instances have small groups of good kinds been got together for home use by interested planters.

It is to be hoped that the matter of growing good mangoes for export will now receive some attention and that in a very short time the formation of orchards of this hardy tree will be undertaken, especially on lands along the Leeward Coast, where conditions are in every way favourable.

The small business in the export of oranges and orange oil was of a value of £776 and £482 respectively. Whether there will ever be much development in this direction appears to be doubtful. This fruit is at present grown mainly in the hills, where there is a considerable area under the best varieties, but the problem of cheap transport to the coast has not yet been solved.

There is one matter in this connection in which experiments are needed. The first crop of fruit matures very early in the hill districts, and shipments have been possible in the past as early as August, a time when few oranges are on the market, but when there is a glut of many other kinds of fruit grown in temperate climates.

Whether the position of the small orange industry could be improved by shipping the best early oranges to northern markets is a matter for careful experiment. This, if successful, would absorb only a small portion of the crop, the balance of which would be available for West Indian markets and for the production of oil. While a small business in oranges is likely to continue, it is apparently one in which no considerable development is to be expected.

The position is, however, somewhat different in regard to grape fruits in which direction there are some prospects of developing a small industry. The best commercial varieties have already been introduced and are available for

## THE FRUIT INDUSTRY.

planting. If these are grown near to the coast an excellent class of fruit can be obtained, that is, if the cultivation is carried on along modern lines. Also by utilizing coastal areas on the Leeward coast, the transport difficulty may be largely overcome.

In any efforts that may be made to cultivate grape fruits, it should be understood by growers that fruit suitable for northern markets can only be produced by a system of intensive cultivation. It is only by the application of suitable manures in order to keep the trees healthy and the fruit free from insect pests, and by a free use of potassic manures to brighten the skins, that the right results will be obtained. Intending planters of grape fruits would do well to bear these points in mind.

The growing of Avocado pears for export would also appear to be worthy of consideration. The increasing demand and good prices for these fruits are favourable factors in the situation. As in the case of the mango, there is no orchard cultivation of the Avocado in this island. Future plantings should be on the orchard system so as to admit of intensive cultivation and high production.

On the whole the outlook for grape fruits, and good varieties of mangoes and avocados, appears to be such as to justify considerable efforts on the part of planters possessing lands favourably situated for the production of these fruits.

*Supplies of Budded and Grafted Plants.*—Any reference to a fruit industry at once brings up the question of a supply of asexually propagated plants of the best varieties for sale to intending growers. In large and progressive countries this line of work is carried on by nurserymen, but in small communities like Dominica the Government nurseries are usually able to meet enquiries for this class of planting material. In the event of a considerable demand arising for grafted and budded fruit trees, the local nurseries, under present working conditions, would not be able to meet it unless some reorganization of current lines of work is effected. In this connection it is suggested that the raising of lime seedlings, which has always been such a large feature of the nursery work, might now cease, so as to allow a greater amount of time and money being devoted to the propagation of fruit trees. At this stage of the lime industry planters might very well be expected to raise lime seedlings for themselves. Such a course would allow of greater efforts being made in the direction of assisting minor industries, and particularly in the establishment of a fruit trade.

While much might be done to increase the output of these plants, it would not be wise for growers to depend entirely upon the Government nurseries since the number grown would always be limited by the time and means available. Further, this line of work is one which requires much forethought, patience and some technical skill. The time required to produce a strong healthy budded citrus plant, ready for planting in the field, counting from the sowing of the seed of the stock, is from two to two and a half years, and of a grafted mango, calculated in the same way from eighteen to twenty months.

By giving up the raising of lime seedlings it would be possible to increase the present output of budded citrus from a few hundreds a year, to several thousands, and of grafted mangoes from a few scores annually to upwards of a thousand. Any demand over this would have to be met by growers themselves, who may be expected to acquire the necessary skill or employ others to do the work for them. Much aid could be given by the Department to propagators in supplying mango stocks, twelve months old, in bamboo pots ready for grafting, and also sour orange stocks of the same age for planting in beds previous to budding. Budwood of the best varieties of citrus, and plants of selected mangoes could also be furnished to beginners.

In the case of Avocado Pears, planters are advised to select seeds of the best kinds during the fruiting season and to sow them in beds; the plants to be transferred to the field when ready and at a suitable time. There are many excellent kinds of avocados in Dominica, and seedlings may very well be planted in the first instance. Later on budding and grafting would no doubt be applied in respect to those kinds found to be best suited to market requirements.

## EXPORTS.

## CHIEF EXPORTS.

TABLE OF AGRICULTURAL EXPORTS FOR THE TRIENNIAL PERIOD  
1919 TO 1921.

|                             | 1919.          | 1920.          | 1921.         |
|-----------------------------|----------------|----------------|---------------|
| <i>Lime Products :</i>      |                |                |               |
| Concentrated juice ...      | 166,718 galls. | 154,040 galls. | 227,716 galls |
| Raw juice ...               | 298,312 "      | 273,082 "      | 112,317 "     |
| Lime juice cordial ...      | 3,965 "        | 7,640 "        | "             |
| Distilled lime oil ...      | 68,787 lb      | 58,151 lb.     | 51,524 lbs.   |
| Ecuellel oil of limes ...   | 16,964 "       | 20,234 "       | 18,551 "      |
| Citrate of lime ...         | 6,772 cwt.     | 6,090 cwt.     | 10,328 cwt.   |
| Green limes ...             | 21,384 brls.   | 19,422 brls.   | 21,883 brls.  |
| Pickled Limes ...           | 485 "          | 645 "          | 399 "         |
| Citric Acid ...             | "              | "              | 2 cwt.        |
| <i>Cacao Products :</i>     |                |                |               |
| Cacao ...                   | 7,387 cwt.     | 5,284 cwt.     | 6,764 cwt.    |
| Prepared Cocoa ...          | 701 lb.        | 816 "          | 1,223 lbs.    |
| <i>Coco-nut Products :</i>  |                |                |               |
| Coco-nuts ...               | 492,426        | 706,979        | 299,787       |
| <i>Coffee Products :</i>    |                |                |               |
| Coffee ...                  | 8 cwt.         | 13 cwt.        | 10 cwts.      |
| <i>Sugar Products :</i>     |                |                |               |
| Rum ...                     | 51 galls.      | 69 galls.      | "             |
| Syrup ...                   | 56 "           | 14,046 "       | 400 galls.    |
| <i>Spices :</i>             |                |                |               |
| Vanilla ...                 | 2,444 lb       | 1,318 lb       | 486 lb        |
| Nutmegs ...                 | £18 worth      | £7 worth.      | £96 worth     |
| Ginger ...                  | 25 brls.       | 24 brls.       | 29 brls.      |
| <i>Honey Products :</i>     |                |                |               |
| Honey ...                   | 162 galls.     | 656 galls.     | 3,412 galls.  |
| Bees-wax ...                | 191 lb         | 125 lb         | "             |
| <i>Various Products :</i>   |                |                |               |
| Bananas ...                 | 2,397 bunches  | 1,492 bunches  | 2,914 bunches |
| Oranges ...                 | 2,030 brls.    | 1,303 brls.    | 1,294 barrels |
| Mangoes ...                 | £318 worth     | £330 worth     | £1,036 worth  |
| Miscellaneous fruits ...    | £111 "         | £66 "          | £238 "        |
| Bay leaves ...              | 54 cwt.        | 144 cwt.       | "             |
| Bay oil ...                 | 2,356 lb.      | 2,432 lb       | 3,000 lbs.    |
| Orange oil ...              | 1,431 "        | 1,856 "        | 844 "         |
| Kola nuts ...               | 1,994 "        | £3 worth       | £25 worth     |
| Cassia fistula ...          | £61 worth      | £143 "         | £86 "         |
| Tamarinds ...               | 64 brls.       | 75 brls.       | "             |
| Vegetables ...              | nil            | £60 worth      | £56 worth     |
| Farine ...                  | 34 bushels     | 18 bushels     | "             |
| Hides and skins ...         | 442 (No.)      | £42 worth      | 33            |
| Plants, bulbs and seeds ... | £22 worth      | "              | "             |
| Fruits, jam and jellies ... | 45 lb.         | 342 lb.        | 523 lb        |
| <i>Forest Products :</i>    |                |                |               |
| Hardwood ...                | 48,817 feet    | 79,706 feet    | 224,245 feet  |
| Firewood ...                | 712 cords      | 760 cords      | £16 worth     |
| Logwood ...                 | 5 "            | 8 "            | "             |
| Canoe Shells ...            | 137 cords      | 152 "          | 62            |
| Hoops ...                   | 18,960 hoops   | 2,300 hoops    | £204 worth    |
| Shingles ...                | 21,000         | 82,000         | 86,230        |
| Other wooden manufactures   | £3 worth       | nil            | "             |
| Charcoal ...                | £36 "          | £40 worth      | £47 worth     |
| Total values ...            | £245,469       | £224,037       | £201,418      |

## Work Connected With Insect and Fungus Pests and Their Control

### COLLAR ROT OF LIMES.

Collar rot of lime trees is a disease which is capable of doing considerable damage in lime cultivation where the first symptoms of infection are overlooked or neglected. There are few estates in Dominica entirely free from Collar rot. Fortunately the disease is not a difficult one to deal with, and where prompt and careful attention is given in treating it in its early stages, there should be little anxiety for the life of a tree thus cared for.

Trees observed bearing an abundance of small fruits and showing a general yellowing and sickly appearance of the leaves may, as a rule, be regarded as bad cases of collar rot. As very severe cases are difficult to deal with, it is important to make an examination of the collar and main roots of a tree as soon as a slight yellowing of the leaves is noticed. Collar rot is so named because the disease is generally first noticed on that part of the tree, but, it is well to remember that the main roots in some cases are also attacked.

The following is an extract from a memorandum on the subject of collar rot by the Mycologist of the Imperial Department of Agriculture:

There can be little doubt that this disease is the same as foot-rot or maldi gomma which causes loss in practically all citrus growing regions.

The disease has been active in Florida for many years and has caused serious losses of seedling oranges, though lemon and grapefruit are also susceptible there. The disease has been largely prevented by budding on sour orange stock which is resistant. Recent investigations in Florida have shown that foot-rot is caused by the fungus *Phytophthora parasitica* Dastur, (American authors use the synonym *Ph. terrestris*, Sherb. although the writer has pointed out the identity of the fungus with Dastur's species described some years earlier than Sherbalroff's strain from tomato). The same fungus has been found in foot-rot in Cuba and Argentina. It is a weakly parasitic species widely distributed in tropical and subtropical soils where rainfall is moderate to heavy and has been recorded as attacking a very wide range of cultivated plants.

The treatment adopted by Mr. Jones is sound as far as it goes but it is not quite clear if all the rotted bark was removed so as to expose only healthy tissues at the edges of the wounds. In Florida it has been found necessary to remove all affected bark with a thin layer of the sap wood and leave only healthy tissue at the margins. If this is not done the fungus may survive in the tissue at the edge of the effected zone and extend the rot during wet weather. This is very liable to occur under such conditions after the soil has been returned to the hole. The scrapings and shavings from the roots and collar should be caught on a piece of burlap and be finally burnt. Bordeaux paste has been recommended for smearing over the wounds but it has been found to promote gumming from the edges and is not permanent. The best application to put on the wounds, as soon as scraping and shaving is finished, is a 20-50 per cent solution of carbolineum or brunolinum using the forms which mix with water if obtainable; if the non-mixable forms are used 1 pound soft soap should be dissolved in the water for each gallon of the preservative subsequently added and the latter well mixed so that no free oil rises to the surface after some hours standing. If wood has been exposed (as it usually is) especially in the roots, the wounds should be covered with an asphalt paint or grafting wax some weeks later and before the soil is returned to the hole. The best time for treatment is during the dry season; the soil which is thrown out also has a chance to dry out and could with advantage be mixed with freshly slaked lime when it is thrown out in order to ensure the destruction of the fungus present in it, which might resist desiccation. In fields where collar rot occurs and has been increasing an examination of the trees should be made during the dry season so that any new infections or enlargement of old treated patches which have occurred during the preceding rainy season can be detected and

## METHODS OF CONTROL.

treated in an early stage. As the disease usually starts at the collar the inspection should not be troublesome. In the case of trees treated both on roots and collar during the preceding dry season it would be advisable to expose the roots to some extent to observe any extensions of old areas or development of new spots.

As Mr. Jones remarks the disease is not confined to low lying wet spots or to stiff soils but it appears on well drained light loams, during or after a protracted spell of wet weather. A predisposing condition, mentioned in pamphlet 79, appears to be a water retaining depression round the base of the tree due to drawing out weeds with soil attached to the roots. Two other predisposing causes might be suggested—deposits of soil and debris left at the base of the tree by floods and slight cracks at the collar and inner ends of the main roots caused by strain during heavy storms followed by a rainy period.

The length of time during which the main roots may require to be exposed after treatment will depend on the extent of the rot originally present and the kind of weather prevailing. In fairly dry weather if the disease has been thoroughly treated a month or six weeks might be sufficient; but during rainy weather a longer exposure is desirable and could not be harmful, provided the holes can be kept properly drained. If they retain water new infections are very liable to occur on roots in contact with the water and so carry the disease deeper into the soil where secondary invaders may find an opportunity to further the destruction of the roots.

## TREATMENT GIVEN TO LIME TREES SUFFERING FROM COLLAR ROT.

An account of experiments conducted on diseased lime trees in the Experiment Station was given in last year's report. The simple treatment then recommended, and which so far has proved satisfactory, is again given for the benefit of those who cannot obtain the necessary materials for treating the trees as recommended in the foregoing memorandum.

A diseased tree should have the soil carefully removed from its collar and roots to a depth of 1 foot, and for about 18 inches from the trunk, round the tree. After laying bare the collar and roots all adhering particles of soil and decayed bark should be washed away and the diseased parts painted with Lime and Sulphur solution, and then left exposed to the air until the trees recover. In each case a small drain should be cut to run off the water that is apt to collect in the hole during wet weather.

## LIME AND SULPHUR SOLUTION.

|                               |     |            |     |     | For small quantities |
|-------------------------------|-----|------------|-----|-----|----------------------|
| Unslaked lime                 | ... | 50 lb.     | ... | ... | 2½ lb.               |
| (or freshly slaked lime)      |     | 70 „       | ... | ... | 3½ „                 |
| Flowers (or flour) of Sulphur |     | 100 „      | ... | ... | 5 „                  |
| Water                         | ... | 50 gallons | ... | ... | 2½ gallons.          |

Mix well with half the water, then add the other half. Boil for an hour in an iron boiler, (or kerosene tin), which must be of sufficient size to contain the large amount of froth formed in the early stages. Stir continually at first; do not let the fire get fierce; avoid the splashes. Add water from time to time to replace that lost in boiling. The result is stock solution, which may be stored if kept in full drums or barrels, or covered with a layer of crude oil or kerosene, so that a minimum of air has access to it. *It is better however to make small quantities as required and use it fresh.* (See above proportion for small quantities). For use as a bark wash 1 part of stock solution is added to 7 parts of water. It may be used stronger, say 1 to 5, *if necessary.*

It may be applied by means of a spraying machine or a brush or a swab tied to stick. It has a strong caustic action, and whatever is used should be well washed in water immediately afterwards. Contact with the skin or clothes should be avoided. Copper vessels should on no account be used.

### TRIALS WITH ATLAS PRESERVATIVE AS A MEANS OF DESTROYING FOREST AND OTHER TREES GROWING ON CULTIVATED LANDS.

The injury done to a plantation by allowing trees foreign to the cultivation to spring up and flourish at the expense of the surrounding crop is usually very great. Some crops may tolerate a certain amount of shade from large trees growing in their midst, but sooner or later such crops will show signs of starvation as the roots of these trees take possession of the soil, and draw heavily upon the supply of plant food constituents, and moisture,

The difficulty of removing these trees from a cultivation without doing damage to the crop may partly account for the presence of fairly large numbers of miscellaneous timber and other trees in Lime and Cacao fields in Dominica.

The practice of ringing the bark of undesirable trees—thus destroying, without felling them—and afterwards removing them piece-meal as they decay, is one of the recognised methods of accomplishing this task with a minimum amount of damage to the cultivation. It must be admitted, however, that this method, though generally effective, is a slow one, and many of the larger trees thus treated linger on in a dying condition for several years. Apart from the slowness of this method it is known to be ineffective on certain species; and to destroy stumps, very young trees, and bushes that are continually sending up young growths from the base, and which require cutting from time to time, entails a good deal of labour and expense.

According to experiments carried out by the Trinidad Forestry Department, a note on which appeared in the *Agricultural News*, Volume XX p. 206, a more rapid process of killing trees is to be found in the use of Atlas Preservative—a commercial preparation highly recommended as a wood ant destroyer, and as a preserver of wood and iron.

In using Atlas Preservative as a tree killer a ring of bark about 9 inches wide should be removed from the trunk of a tree with a hatchet or cutlass, and the undiluted preparation applied to the exposed cambium layer with an ordinary paint brush. It has been recommended that where it is desired to kill a palm, a ring 1 inch deep should be cut. It would appear from the good results obtained in an experiment carried out by a Dominica planter, that the operation in the case of palms may be simplified, and at the same time performed at less cost than by the method of ringing, if three holes about three inches deep be made in a trunk and a little poison poured in each. These holes should have a downward tendency in order to prevent the escape of the poison. Since the trunk of a palm is very hard and difficult to cut, this method certainly commends itself on the score of being less expensive. It might also be recommended as the best means of killing a palm without weakening the trunk which weakening, in the case of a very tall plant, causes it to become a danger during high winds to surrounding cultivation, and possibly to buildings as well. It may here be mentioned that labourers using this solution should be warned of its poisonous nature; and splashes to the eyes should be guarded against.

It was found in the Trinidad experiments that some trees were more susceptible to the poison than others. This has also been found to be the case in the trials which were undertaken by this Department at the Lime Experiment Station in December 1921.

White Cedars, *Tabebuia leucoxydon*; Sweet and Sour Sops, *Anona* spp; and a native fig, *Ficus* sp. were found to be very susceptible; whereas seedling mangoes, cashews, tamarinds, and a sapodilla were more resistant. Most of the seedling mangoes treated, it should be mentioned, were very large trees, and had been barked two or more years previous, to the recent experiment with Atlas Preservative. When treated with Atlas Preservative most of those mango trees were more or less in a dying condition as a result of the previous barking, and as the flow of sap was naturally very feeble, the poison was not circulated thoroughly and quickly enough to bring about the desired effects in the space of a few weeks, as it would have done in the case of healthy and vigorous trees. There can be no doubt, however, that this application of poison is hastening the death of these particular trees, in spite of their having been previously barked.

## EXPERIMENTS FOR DESTROYING TREES ON CULTIVATED LANDS.

The following results obtained in the trials at the Lime Experiment Station with trees that were not barked until the day when the experiment with Atlas Preservative was commenced, may be accepted as a fair indication of the value of this poison ; and should be of interest to those who wish to give this method of destroying undesirable trees a trial.

## TAMARINDS

- (1) Circumference of trunk 4 feet.

Poisoned December 20, 1921.

Many of the leaves dropped, and one fairly large branch died a few weeks later. This tree is likely to recover. It was the first tamarind tree to be treated, and the fact that it is resisting the poison is probably due to the cut not having been made deep enough.

- (2) Two tall stumps, each with a circumference of about  $2\frac{1}{2}$  feet.

Poisoned December 20, 1921.

All leaves fell within a fortnight, and the stumps died a week or two later.

## SAPODILLA.

Circumference 5 feet.

Poisoned December 22, 1921.

The effects of the poison on this tree did not show up until the end of the third month, when a few leaves turned brown, and the tree started to die slowly.

## MANGOES

- (1) Very large seedling mango.

Circumference 9 feet.

Poisoned December 21, 1921.

Dead in a little over 3 months.

- (2) Circumference 7 feet.

Poisoned December 21, 1921.

Dead 4 months later.

## CASHEWS.

Twenty large cashew trees were poisoned on December 22, 1921. Most of these were found to be dead 6 weeks later. The others are dying.

WHITE CEDARS, (*Tabebuia leucoxylon*).

A large number of trees were poisoned on December 22 1921. The circumference of the largest measured 4 feet ; the smallest, 2 feet. Most of these trees died within a month. The others died later.

NATIVE FIG (*Ficus sp.*)

Circumference of trunk 4 feet (also several aerial roots varying in circumference measurement from  $1\frac{1}{2}$  to 3 feet.)

Poisoned December 14, 1921.

## CHEMICAL INVESTIGATIONS.

All leaves had fallen a month later and by March 31 1922 the tree was dead. (A ring of bark was removed from every aerial root, as well as from the trunk, and the poison applied.)

SOUR AND SWEET SOPS, (*Anona spp.*)

Several sweet and sour sops were treated on December 20 1921, and died within a month (most of the leaves, both of sweet and sour sops, turn brown in about 3, or 4 days)

## GUAVAS.

Two small guava bushes were treated, and dropped their leaves 3 days later. In treating these plants the stems were bent over until they snapped, and the poison was applied to the crack. In addition to guavas, many other plants such as Horse tamarinds, and other weeds, have been quickly destroyed in a new clearing, now being planted in limes in the Experiment Station.

It would appear from the good results obtained with Atlas Preservative by this Department, that this preparation should prove of great value on estates over-run with guava, and other troublesome weeds. The trouble and expense to which planters are put in their attempts to rid pasture land of such pests as guava, and horse tamarind, are matters which might be overcome easily, and inexpensively, by applying Atlas solution.

It would, of course, be necessary to prevent stock from gaining access to the pasture until the plants had been killed, and the leaves and twigs had been burnt, but this would only be a matter of a few weeks; and the cost of destroying such bush would be comparatively small, while the results obtained would be permanent.

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## Chemical Investigations.

### A RESUME OF THE WORK CARRIED OUT FOR DOMINICA BY THE CHEMICAL STAFF OF THE FEDERAL AGRICULTURAL DEPARTMENT DURING THE PERIOD JANUARY 1, 1921 TO JULY 15, 1922.

During the period under review four official visits were paid to Dominica: two by Mr. A. E. Collens, Government Chemist and Superintendent of Agriculture, and two by the Assistant Chemist, Mr. F. H. S. Warneford. During these visits analytical work and certain special investigations were conducted in the laboratory at the Botanic Gardens.

Analyses and investigations were also made at the Federal Laboratory in Antigua, while a certain amount of consultation work was undertaken more especially during the visits to Dominica recorded above. Tobacco, bay oil and rum manufacture are among the subjects discussed.

## CHEMICAL INVESTIGATIONS.

The following is a summary of the samples analysed :

|                                                                  |     |     |     |     |             |
|------------------------------------------------------------------|-----|-----|-----|-----|-------------|
| Milk                                                             | ... | ... | ... | ... | 67 samples  |
| Lime juice (total acid)                                          | ... | ... | ... | ... | 5 "         |
| Lime juice (true citric acid)                                    | ... | ... | ... | ... | 2 "         |
| Calcium citrate (citric acid, total organic acids and free lime) | ... | ... | ... | ... | 7 "         |
| Citric liquors (free sulphuric acid)                             | ... | ... | ... | ... | 2 "         |
| " " (true citric acid)                                           | ... | ... | ... | ... | 2 "         |
| Citric acid crystals (moisture and true citric acid)             | ... | ... | ... | ... | 1 "         |
| Coral (suitability for making lime for citrate)                  | ... | ... | ... | ... | 1 "         |
| Lime (suitability for citrate manufacture)                       | ... | ... | ... | ... | 2 "         |
| Water (suitability for citrate and citric acid manufacture)      | ... | ... | ... | ... | 2 "         |
| Water (examination for lead)                                     | ... | ... | ... | ... | 2 "         |
| Preparation and testing of standard solutions                    | ... | ... | ... | ... | 6 "         |
| Lime oil                                                         | ... | ... | ... | ... | 7 "         |
| Residue from steamers at Bath Factory                            | ... | ... | ... | ... | 1 "         |
| " " crystalisers at Bath Factory                                 | ... | ... | ... | ... | 1 "         |
| Decayed lime skins (manurial value)                              | ... | ... | ... | ... | 1 "         |
| Residue from ecuelling lime fruits                               | ... | ... | ... | ... | 1 "         |
| Sweetened lime juice                                             | ... | ... | ... | ... | 1 "         |
| Lime juice cordial                                               | ... | ... | ... | ... | 1 "         |
| Manures                                                          | ... | ... | ... | ... | 2 "         |
| Hydrometer (standardization)                                     | ... | ... | ... | ... | 1 "         |
| Citrate effluent                                                 | ... | ... | ... | ... | 2 "         |
| Copra                                                            | ... | ... | ... | ... | 2 "         |
| "Overburnt" lime                                                 | ... | ... | ... | ... | 1 "         |
| Soils (pH value)                                                 | ... | ... | ... | ... | 2 "         |
| Molasses                                                         | ... | ... | ... | ... | 1 "         |
| Bay oils                                                         | ... | ... | ... | ... | 2 "         |
|                                                                  |     |     |     |     | 125 samples |

**THE ROSEAU MILK SUPPLY.** The analysis of the sixty-seven samples of milk were carried out at the Dominica laboratory during the chemist's visits and represent an attempt to control the sale of milk in Roseau. Such a spasmodic method of control is, however, unsatisfactory and the new milk by-law which embodies the English legal standards for milk has taken cognisance of this fact and makes provision for the acceptance of the analyst's certificate as evidence. This makes possible the sending of formalised samples to the Federal Laboratory when no chemist is in the island.

The following summary of the 67 samples may be of interest.

| Date.          | No. of samples. | Adulterated, per cent. | Genuine & doubtful, per cent. | Added water, per cent. | Average fat Content, all samples per cent. | Genuine samples, per cent. |
|----------------|-----------------|------------------------|-------------------------------|------------------------|--------------------------------------------|----------------------------|
| June-July 1921 | 18              | 7 39                   | 11 61                         | 19—56                  | 3·7                                        | 4·4                        |
| November 1921  | 18              | 7 39                   | 11 61                         | 8—20                   | 3·0                                        | 4·0                        |
| April-May 1922 | 19              | 6 31·6                 | 13 68·4                       | 6·5-28                 | 3·7                                        | 4·13                       |
| June-July 1922 | 12              | 3 25                   | 9 75                          | 12—14                  | 4·07                                       | 4·45                       |

It will be observed that as a rule Dominica milks are rich in fat, as, even when the adulterated milks are included, the average fat content is above the legal standard.

The effect of chemical control of the milk supply is shown in the decrease in the percentage of adulterated samples and more particularly in the decrease in the percentage of added water. It is of course possible that the decrease in sophistication observed has coincided with the visit of a chemist and that adulteration has been rife during the intervening periods.

## CHEMICAL INVESTIGATIONS.

## SPECIAL INVESTIGATIONS.

Various investigations have been undertaken, especially in connection with the citrus industry.

*The utilization of lime seeds.* The most important completed investigation has been the examination of lime seeds with a view to their utilization as a by-product. It is estimated that an average of about 535 tons lime seeds are produced annually in Dominica—the larger portion being disposed of as waste material.

Tempany, West Indian Bulletin Vol. XV. No 1) determined the manurial and feeding value of lime seeds and examined the oil obtained on extraction of the crushed seeds with chloroform—no further developments took place, however, until during the last six months, when it has been found possible to extract 70% of the total oil present by subjecting the crushed seed to pressure in a small hand press after a preliminary warming to about 120°F.

The oil as first extracted is cloudy and somewhat bitter. Warming with filter-cel followed by filtration removed the cloudiness, while treatment with alcohol removed the bitter principle, leaving a bland almost tasteless oil, which might prove suitable as a salad oil.

An analysis of the oil conducted at the Federal laboratory gave the following data:—

|                           |     |     |                | <i>Tempany's results.</i> |
|---------------------------|-----|-----|----------------|---------------------------|
| Sp. Gr. 27/15.5           | ... | ... | 0.9138         | 0.9160                    |
| R. Index @ 28°            | ... | ... | 1.4740         | 1.4700                    |
| Iodine Absn. (Hubl.)      | ... | ... | 100.75         | 153.9                     |
| Saponification equivalent | ... | ... | 289.8          | 339.6                     |
| Acid value                | ... | ... | 11.2           |                           |
| Alcohol soluble           | ... | ... | 1.16 per cent. |                           |
| Unsaponified matter       | ... | ... | 0.78 per cent. |                           |
| Setting point             | ... | ... | —3° C.         | 6—7° C.                   |

The oil belongs to the class of semi-drying oils; it is readily saponified even at room temperature and experiments are being carried out to determine its suitability for the manufacture of soap. A sample has been sent to the Imperial Institute for commercial valuation.

The manurial and feeding values of the press cake are recorded below:—

## MANURIAL VALUE.

|                      |     |     |     |                |
|----------------------|-----|-----|-----|----------------|
| Nitrogen             | ... | ... | —   | 4.90 per cent. |
| Potash               | ... | ... | ... | .685 "         |
| Phosphoric anhydride | ... | ... | —   | 1.05 "         |

## FEEDING VALUE.

|                |     |     |     | Lime seed press cake,<br>(Per cent.) | Uncorticated cotton<br>seed meal.<br>(Per cent.) |
|----------------|-----|-----|-----|--------------------------------------|--------------------------------------------------|
| Moisture       | ... | ... | ... | 15.08                                | 11.32                                            |
| Ash            | ... | ... | ... | 3.17                                 | 5.64                                             |
| Oil            | ... | ... | ... | 14.20                                | 6.16                                             |
| Crude proteins | ... | ... | ... | 30.50                                | 23.75                                            |
| Crude fibre    | ... | ... | ... | 20.05                                | 21.80                                            |
| Carbohydrates  | ... | ... | ... | 17.00                                | 31.33                                            |

The feeding value of uncorticated cotton seed meal is shown for purposes of comparison. It will be seen that the lime seed press cake compares favourably as a food with the cotton seed meal, being slightly lower in carbohydrate but richer in crude protein.

Feeding experiments have been carried out with the press cake. Cattle and mules eat it fairly readily but the quantity of meal available has not been adequate to determine its physiological action on the stock to which it is fed.

*Recovery of hand pressed lime oil from ecuelle sludge and from lime lees.* Hand pressed lime oil has been readily recovered from the sludge from the ecuelling machine by simple filtration in canvas bags, whereby most of the aqueous layer is removed followed by pressing the residue contained in the canvas bag in hand press. The effluent from the press is a mixture of oil and water which are separated in a glass separatory funnel.

The quantity of oil recovered is about 80 per cent of the amount present. The recovery of lime oil from lime lees or lime pulp is a somewhat harder problem owing chiefly to the smaller percentage of oil present in this product.

After numerous unsuccessful attempts it has been found that if the lime lees is mixed with sufficient fullers earth or filter-cel to allow of filtration from most of the juice present, a considerable portion of the oil can be recovered from the residue by pressing in the same way as the ecuelled residue is treated.

This investigation is not yet completed: Experiments are being carried out to determine the minimum quantity of filtering agent required to produce a sufficiently rigid cake to be subjected to pressure.

*Concentration of Lime Juice.* Attempts have been made to prepare a light coloured concentrated lime juice suitable for direct use as a substitute for citric acid especially in soda fountains. If lime juice is clarified by treatment with filter-cel and subsequent filtration a perfectly clear bright yellow liquid results which yields an amber coloured concentrate when concentration is carried out under reduced pressure at a temperature of about 50° C. Unfortunately, however, this light coloured product darkens on keeping unless absolutely excluded from the air. An enquiry is being made into the reason for this behaviour.

It is of interest to note it has been found possible to obtain crystals of citric acid from concentrated juice—the amount of acid crystallising is, however, small. Further attention is being given to this matter.

*The nature of the colouring matter of lime juice.* This investigation, which is being undertaken in collaboration with Mr. F. Hardy, Chemist on the staff of the Imperial Department of Agriculture, was initiated with the view to determining the reasons for the darkening of lime juice on exposure to the air and on concentration—a knowledge of the factors causing this phenomenon being requisite before systematic attempts can be made to obviate it. This subject also has a bearing on the manufacture of citric acid as a certain amount of colouring matter is retained in the manufacture of citrate and passes into the citric liquors, from which it must be removed by treatment with a decolourising carbon.

*The manufacture of calcium citrate.* This investigation also is being carried out in collaboration with Mr. F. Hardy. A study is being made of the effect of various factors on the manufacture of citrate—the object being the production of a citrate pure enough to yield colourless or almost colourless citric acid without any clarification of the citric liquors.

*The manufacture of rum.* Experiments have been conducted both in the laboratory and on the plant with Magne's pure culture yeast. The method of fermenting usually adopted in Dominica is to allow the action of naturally occurring air born yeasts. Under such conditions the changes taking place in the wash represent the resultant of the actions of various competing organisms, some of which are injurious to alcoholic fermentation and cause the formation of by-products.

In the pure culture process the wash is inoculated with an organism whose action on the sugars present is almost exclusively, decomposition into alcohol and carbon dioxide. This organism multiplies rapidly and in virtue of the large numbers added at the start of the fermentation it has an enormous advantage in its competition with any others which may accidentally find their way into the wash: moreover the conditions such as reaction, temperature and food supply are so adjusted as to favour its growth rather than that of its competitors.

In one experiment in which the total sugars in the wash was accurately estimated the yield of alcohol produced by fermentation was 89% of the maximum allowed by theory, 97 per cent. of this alcohol being recovered by the still. Unfortunately this very satisfactory yield was not duplicated in subsequent experiments: the causes for this divergence have not yet been established.

*Camphor Experiments.* Distillations of camphor have been carried out to determine the yield from leaves compared with the yield from leaves and twigs

The yield of camphor obtained from leaves in February 1922 was 1.57 per cent. reckoned on the oven dried leaves. The yield from leaves and twigs distilled in May was 1.75 per cent. reckoned on the oven dried material. In the earlier distillation there was hardly any oil whereas in the May distillation 0.23 per cent. oil was obtained.

Attempts have been made to ferment orange juice for the production of vinegar. So far, however, with indifferent success; this is probably due to the inhibiting action of traces of orange oil present in the juice. It is proposed to repeat the attempt with juice from which the essential oil has been removed by distillation.

## AGRICULTURAL INSTRUCTION.

In October, one pupil was discharged for not making satisfactory progress, and in November, another pupil left the Department to join the Police Force

### SELECTION OF NEW PUPILS.

During the year a number of boys presented themselves at the Gardens at the invitation of the Agricultural Superintendent and were examined in the elementary subjects of a seventh standard public school, whereby some idea of the candidates' fitness to receive the agricultural course of training was fairly ascertained. As a result of the examination three boys were found to possess a fairly good knowledge of the subjects in which they were examined, and were finally selected for a two years' course of training in the Department.

There is now a total of four pupils under training.

### INSTRUCTION TO PUPILS.

The chief feature of the system of training is, that the practical work performed by the pupils who are daily employed in the general routine work of the Botanic and Experiment Stations, is blended with a certain amount of theoretical agricultural teaching which they receive every Saturday morning in the class room from 8 a.m. to 12 noon.

In the course of this class of work, knowledge is imparted to the pupil which will enable him to appreciate thoroughly the reasons for the adoption of any given agricultural procedure, and to read and understand the literature of the subject, so that by the time his training expires, he is in such a position that he can further increase his knowledge by his own observations and efforts.

During their course of instruction in practical agricultural operations, the pupils are always under the supervision of an officer of the Department. This detailed supervision of the field work provides instruction to the boys as to the necessity of neatness and correct ideas in all field operations, while the appreciation of the importance of careful observations, and of the keeping of correct records is being inculcated.

### CLASS WORK.

*Air and Water.* Constituents of air; composition of water.

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*Soil.* Chemical composition of soils, the chemical and physical properties of sand, clay, chalk and humus; classification of soils; Drainage; Micro-organisms in soil and in relation to leguminous plants; notes on soil water; tillage and its effects.

*Manures.* Properties of the most common artificial manures and of lime; Green dressing and organic manures.

*Pests and Diseases of Plants.* Notes on insects and insecticides; Notes on Fungi and fungicides.

*Agricultural Botany.* The seed and its germination; Structure and function of root, stem, leaf and flower; Pollination and fertilization. Description of flowers; Assimilation, Respiration, Transpiration; Plant food; Essential elements of plant food; Absorption and movement of water in plants. Pruning; Grafting and budding, and other means of propagating plants.

*Economic Botany.* Cultivation and preparation of the principal economic products of the tropics with special reference to the West Indies. Limes, Cacao, Coco-nuts, Sugar, Cotton, Rubber (*Hevea brasiliensis*), Coffee, Bananas, Vanilla, Oranges, Cassava, etc.

#### FIELD WORK.

Pruning lime trees, dressing wounds; mixing and applying insecticides and fungicides; sowing green dressings seed; budding limes; applying manures; pollinating vanilla flowers, etc.

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## Plant Legislation in Dominica.

The first step in the direction of plant protection was taken in 1898, when Act No. 3 was passed to provide against the importation of articles likely to introduce diseases among plants. Under the authority of this Act, a Proclamation dated August 27, 1898, prohibited the importation from Ceylon of plants, seeds, berries, earth and soil. This Act was suspended by Law No. 9 of 1904, in which provision is made for the fumigation and disinfection of imported plants, cuttings, buds, grafts, bulbs, roots, and seeds, and their packages: also fruit and vegetables intended for propagation, and not for consumption as food.

Under Law No. 6 of 1907, power is conferred to prohibit by proclamation the importation of plants, cuttings, bulbs, roots, seeds, or berries, or any earth or soil, or any articles packed therein, or any packages, or other articles or things likely to be the means of introducing any plant disease.

A Proclamation dated February 5, 1909, under No. 6 of 1907, prohibits the importation into Dominica of all plants from Dutch Guiana, which are likely to be a means of introducing disease from that country.

A Proclamation dated October 26, 1910, prohibits the importation of banana plants and suckers from all countries of Central or South America, and from the island of Trinidad, also of coco-nuts in husk, and all growing plants or parts of plants of coco-nuts, from Cuba, Jamaica, Trinidad, and all countries of Central or South America.

A Proclamation dated August 7, 1915, prohibits the importation of citrus plants and citrus budwood from the United States of America. This is superseded by a Proclamation dated October 9, 1916, which applies to citrus plants, citrus budwood, or citrus fruit, or any parts of such plants, from the United States of America, Cuba, Jamaica, Haiti, San Domingo, and Porto Rico.

A second Proclamation of the same date restricts, under certain conditions, the entry of rooted plants from the countries named in the above Proclamation.

A Proclamation dated October 29, 1917, prohibits the importation of seed-cotton or cotton seed from all countries or places outside the Colony of the Leeward Islands, save and except from some other Presidency of the Colony, or from the Colony of Trinidad and Tobago, and its dependencies, or from the Colonies of Grenada, St. Vincent, and St. Lucia, provided, however, that small

## DETAILS OF ADMINISTRATION.

quantities of cotton seed for experimental purposes may be imported into the Presidency of Dominica, on the written permission of the Superintendent of Agriculture, on such terms and conditions as he may prescribe.

A Proclamation dated March 8, 1919, prohibits the importation from any country, save and except the islands of Montserrat, St. Lucia, and Grenada, of any citrus plants, or parts thereof, including the fruit thereof, as these are likely to be a means of introducing the plant disease known as 'Bloom Blight' and 'Wither Tip Disease.' It is, however, allowed that the Curator or Agricultural Officer shall have the power to import for scientific purposes, anything thus prohibited on his making a report of such importation for the information of the Governor.

A Proclamation dated March 8, 1919, prohibits the importation from the islands of Trinidad and Grenada of growing and sprouting coco-nuts, as likely to be a means of introducing the plant disease known hitherto as 'Root disease of coco-nuts' but to be called in future the 'Red Ring' disease of coco-nuts.'

A Proclamation dated December 21, 1920, prohibits from any other country into this Presidency, the importation of sugar-cane for the time being.

A Proclamation dated February 21, 1921, prohibits from any other country into this Presidency, the importation of Johnson Grass (*Holcus halepensis*).

With regard to the export of plants, it is only necessary to state that such cannot be admitted into the United States unless accompanied by a certificate showing that they have been inspected by a duly authorized official, and found free from injurious plant diseases or insect pests.

## CROP YIELDS AT THE GARDENS.

The cacao crop for the year ended June 30, 1922, was 66 cwt. The average annual crop for a period of five years, 1918-22, was 70 cwt. from an area estimated at  $7\frac{1}{2}$  acres.

There were also sold locally 2,485 barrels of limes, as well as considerable quantities of mangoes and citrus fruits and a few small lots of nutmegs.

The rainfall for the year ended June 30, 1922 was 68.50 inches.

## DETAILS OF ADMINISTRATION.

## EXPENDITURE.

The Votes for the Agricultural Department for the year were as follows :—

|                                       |     |     |     | £     | s | d |
|---------------------------------------|-----|-----|-----|-------|---|---|
| Salaries, Curator, Assistant Curator, | ... | ... | ... |       |   |   |
| Foreman, Clerk and Watchman           | ... | ... | ... | 863   | 0 | 0 |
| Contingencies                         | ... | ... | ... | 10    | 0 | 0 |
| Travelling Expenses                   | ... | ... | ... | 50    | 0 | 0 |
| Maintenance                           | ... | ... | ... | 320   | 0 | 0 |
| Cultivation of Saleable Products      | ... | ... | ... | 300   | 0 | 0 |
| Fumigation of imported plants         | ... | ... | ... | 5     | 0 | 0 |
| Maintenance Public Gardens            | ... | ... | ... | 15    | 0 | 0 |
| Purchase of Special Manures           | ... | ... | ... | 130   | 0 | 0 |
| Printing Reports, etc.                | ... | ... | ... | 40    | 0 | 0 |
| Experiment Station                    | ... | ... | ... | 400   | 0 | 0 |
| Purchase of Vegetable seeds           | ... | ... | ... | 25    | 0 | 0 |
| Trial Shipments of fruit              | ... | ... | ... | 20    | 0 | 0 |
| Field Experiments                     | ... | ... | ... | 20    | 0 | 0 |
| Chemicals & Apparatus                 | ... | ... | ... | 25    | 0 | 0 |
| Telephone Rental                      | ... | ... | ... | 8     | 0 | 0 |
| Uniform for Watchman                  | ... | ... | ... | 3     | 0 | 0 |
| Agricultural Instruction              | ... | ... | ... | 195   | 0 | 0 |
|                                       |     |     |     | 2,429 | 0 | 0 |

## STAFF CHANGES, &amp;C.

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The actual expenditure during the year under the above heads was £2,275. 18. 2.

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**RECEIPTS**

The receipts under the various heads were as follows :—

|                 | £   | s. | d. |
|-----------------|-----|----|----|
| Limes           | 456 | 8  | 3  |
| Cacao           | 237 | 11 | 5  |
| Plants          | 73  | 8  | 8  |
| Fruit           | 60  | 9  | 9  |
| Vegetable seeds | 16  | 6  | 6  |
| Miscellaneous   | 4   | 8  | 7  |
|                 | 848 | 13 | 2  |

The receipts for the past three years, during the last two of which both limes and cacao sold at low rates, averaged £1,000 per year. With some improvement in market conditions for these products, coupled with an expected steady increase of output, the income of the Agricultural Department in coming years should show a considerable advance over the above figure.

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**STAFF CHANGES.**

Mr. J. Jones, Curator, was granted three months sick leave commencing on February 1, 1921.

Mr. A. Keys, Assistant Curator, in conjunction with his own duties, performed those of the Curator during the above mentioned period of leave.

In connexion with Agricultural Instruction, Altius Joseph, senior agricultural pupil, was selected as overseer in place of David Green, on the expiration of the latter's term of service.

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**ADDITIONS AND REPAIRS.**

A shed erected in the Lime Experiment Station in 1918 to house a mill, was furnished during the early part of the year with doors and iron-work sides; this shed was also painted both inside and outside.

The head labourer's house in the Experiment Station received a coat of paint on the outside.

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**CORRESPONDENCE AND DISTRIBUTION OF INFORMATION.**

During the year 694 communications were despatched from the office of the Department, and 106 minute papers dealt with. Fifty-four copies of the West Indian Bulletin were distributed free of charge to leading planters, officials, and others in the Island.

As usual a considerable number of planters and others desiring information on agricultural matters called at the Gardens during the year.

Several new books were added to the Garden Library during the year, and the publications of a number of Tropical Agricultural Departments were duly received. The opportunity is again taken to thank those Departments who kindly forwarded their publications.

### PLANT AND SEED EXCHANGES.

Contributions of seeds were received from the following:—The Imperial Commissioner of Agriculture for the West Indies; Royal Botanic Gardens, Kew; United States Department of Agriculture; Royal Botanic Gardens, Calcutta; The Director of Agriculture, Federated Malay States; The Director of Agriculture, Ceylon; Botanic Gardens, Gwalior, India; Agricultural Department, Kuala, Lampur; Ministry of Agriculture, Cairo; The Agricultural Departments of Trinidad, Barbados, Antigua and Montserrat; The Hon. Dr. Nicholls, C.M.G., Mrs. Burdon, St. Kitts; His Honour Mr. Justice Pemberton, and Eugene Andre, Esq.

Seeds and plants were sent to: The Royal Botanic Gardens, Kew; Agricultural Department, Ceylon; Ministry of Agriculture, Cairo; Imperial Forest School.

Dehra-Dun, India; The Director, State Gardens, Gwalior, India; The Agricultural Departments of Trinidad, Barbados, Antigua, Grenada, St. Vincent, and Montserrat; The Experiment Station, Tortola; Government House, Antigua; and to the Montserrat Company.

### OFFICIAL AND OTHER VISITS TO THE GARDENS.

His Excellency the Governor, the Hon. Sir Eustace Fiennes, Bart., accompanied by the Hon. Lady Fiennes, O.B.E., paid a visit to the Gardens on December 21.

Mr. T. G. Mason, M.A., Sc. B., Botanist on the staff of the Imperial Department of Agriculture, visited the Gardens on April 13.

Mr. F. H. S. Warneford, B.A., B. Sc., Assistant Government Chemist for the Leeward Islands, arrived in Dominica on June 7, for the purpose of undertaking chemical investigations. Mr. Warneford sailed for Antigua on July 9.

Mr. K. W. Earle, M. Sc., F.G.S., Geologist on the staff of the Imperial Department of Agriculture, arrived in the island on June 21, and left for Barbados on July 18. He again visited Dominica on March 27.

Mr. A. E. Collens, F.I.C., F.C.S., Government Chemist and Superintendent of Agriculture for the Leeward Islands, arrived in the island on November 8 for the purpose of undertaking chemical investigations. Mr. Collens returned to Antigua on November 25.

Other visitors during the year were Mr. R. S. Cunliffe, B.Sc., West Indian representative of the Nitrate Agencies, and Professor L. H. Bailey of New York.

### METEOROLOGICAL RETURNS.

Temperatures and other meteorological observations were recorded during the year, a summary of which is given in a table on another page.

#### RAINFALL.

The rainfall at the Botanic Gardens for 1921 amounted to 61.72 inches, or 12.74 inches less than the previous year, and 15.32 inches less than the average annual precipitation for the last twenty-nine years, which is 77.04 inches.

The following table shows the mean monthly and annual rainfall at the Botanic Gardens from 1893 to 1921, a period of twenty-nine years.

Following the above will be seen the monthly rainfall at the twenty-seven recording stations located in different parts of the island. The thanks of the Department are due to those planters who furnish the information from year to year.

RAINFALL AT THE BOTANIC STATION, DOMINICA. 1893-1921.

| Month.    | 1893. | 1894. | 1895. | 1896. | 1897. | 1898. | 1899. | 1900. | 1901. | 1902. | 1903. | 1904. | 1905. | 1906. | 1907. | 1908. | 1909. | 1910. | 1911. | 1912. | 1913. | 1914. | 1915.  | 1916. | 1917. | 1918. | 1919. | 1920. | 1921. | Mean monthly rainfall. |
|-----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|-------|-------|-------|-------|-------|-------|------------------------|
| January   | 3.62  | 10.20 | 4.08  | 5.52  | 2.60  | 3.00  | 6.78  | 2.25  | 4.52  | 2.01  | 3.10  | 7.92  | 3.86  | 3.74  | 4.48  | 1.56  | 2.30  | 5.20  | 11.45 | 8.21  | 7.48  | 3.22  | 1.76   | 10.79 | 5.00  | 6.02  | 2.42  | 7.54  | 6.82  | 5.08                   |
| Feb. ...  | 7.65  | 4.99  | 1.09  | 1.23  | 3.21  | 2.11  | 3.00  | 1.15  | 0.88  | 0.43  | 5.01  | 5.58  | 2.56  | 2.04  | 3.82  | 1.16  | 5.02  | 11.42 | 4.00  | 1.32  | 2.32  | 5.56  | 1.04   | 1.90  | 4.10  | 8.73  | 1.52  | 4.76  | 1.02  | 3.40                   |
| March     | 2.97  | 4.39  | 5.35  | 2.73  | 3.36  | 1.53  | 1.32  | 3.56  | 3.27  | 2.69  | 2.44  | 2.16  | 4.38  | 0.90  | 1.96  | 3.68  | 2.08  | 1.16  | 3.11  | 4.60  | 7.29  | 2.23  | 0.84   | 4.52  | 6.74  | 3.32  | 0.69  | 3.80  | 4.46  | 3.15                   |
| April ... | 4.71  | 2.33  | 2.92  | 1.27  | 1.39  | 0.75  | 0.60  | 1.29  | 0.25  | 2.80  | 0.57  | 1.64  | 1.90  | 3.18  | 2.66  | 3.08  | 8.12  | 2.86  | 5.00  | 3.38  | 1.57  | 6.45  | 15.75  | 1.22  | 0.47  | 1.86  | 2.36  | 2.22  | 3.06  | 2.88                   |
| May ...   | 5.45  | 3.09  | 10.08 | 6.12  | 12.75 | 1.19  | 1.76  | 7.62  | 2.05  | 6.86  | 2.44  | 1.58  | 4.82  | 3.78  | 1.64  | 2.24  | 1.92  | 7.30  | 11.16 | 1.56  | 3.46  | 2.58  | 3.65   | 2.05  | 2.94  | 5.90  | 4.60  | 2.38  | 1.54  | 4.27                   |
| June ..   | 16.12 | 8.20  | 1.19  | 8.23  | 6.50  | 11.78 | 7.23  | 5.59  | 12.18 | 12.89 | 9.02  | 6.00  | 5.54  | 9.46  | 5.54  | 6.16  | 9.00  | 14.26 | 6.54  | 5.44  | 3.49  | 7.27  | 9.17   | 4.82  | 15.34 | 6.04  | 3.88  | 3.48  | 1.96  | 7.73                   |
| July ...  | 13.67 | 8.62  | 7.13  | 14.88 | 8.80  | 14.75 | 10.08 | 10.50 | 22.96 | 9.74  | 8.91  | 10.38 | 6.10  | 10.10 | 8.00  | 9.22  | 9.86  | 12.60 | 8.08  | 5.83  | 7.57  | 11.83 | 14.84  | 8.23  | 13.70 | 11.28 | 12.64 | 12.08 | 11.18 | 10.87                  |
| August    | 11.86 | 5.84  | 9.67  | 7.07  | 8.87  | 16.35 | 6.32  | 7.34  | 13.53 | 7.41  | 18.41 | 7.69  | 14.18 | 7.30  | 7.40  | 9.41  | 13.12 | 10.22 | 11.43 | 4.88  | 10.93 | 3.98  | 14.74  | 16.58 | 8.53  | 8.46  | 9.64  | 8.76  | 9.30  | 9.97                   |
| Sep. ...  | 11.15 | 8.22  | 17.72 | 6.47  | 4.51  | 7.89  | 7.04  | 5.28  | 5.86  | 8.62  | 9.69  | 11.32 | 8.92  | 10.88 | 11.60 | 7.52  | 6.44  | 8.90  | 15.34 | 3.32  | 8.39  | 7.71  | 11.36  | 6.20  | 15.02 | 4.14  | 7.06  | 8.60  | 6.28  | 8.67                   |
| October   | 8.94  | 14.41 | 11.32 | 3.93  | 8.42  | 7.97  | 1.81  | 6.60  | 4.84  | 5.75  | 12.73 | 10.21 | 9.10  | 8.12  | 7.80  | 5.12  | 13.10 | 3.82  | 7.06  | 7.26  | 10.40 | 5.13  | 8.41   | 10.06 | 2.46  | 6.67  | 7.50  | 12.60 | 9.44  | 7.97                   |
| Nov ...   | 3.18  | 6.14  | 11.21 | 16.81 | 7.81  | 6.55  | 5.02  | 3.49  | 6.43  | 11.20 | 4.17  | 3.13  | 5.48  | 9.58  | 5.98  | 1.96  | 4.36  | 5.40  | 6.94  | 11.20 | 4.28  | 9.44  | 10.05  | 14.28 | 1.92  | 3.36  | 9.02  | 4.62  | 2.44  | 6.74                   |
| Dec. ...  | 10.61 | 4.99  | 5.66  | 6.60  | 10.55 | 5.86  | 2.19  | 3.68  | 4.32  | 7.16  | 14.23 | 4.84  | 5.72  | 2.94  | 8.42  | 7.80  | 5.82  | 7.50  | 7.14  | 6.66  | 2.72  | 9.70  | 8.40   | 3.77  | 4.58  | 5.86  | 6.70  | 5.62  | 4.22  | 6.38                   |
| Total     | 99.93 | 81.44 | 89.12 | 80.86 | 78.77 | 79.73 | 53.15 | 58.35 | 81.09 | 77.56 | 90.72 | 72.45 | 72.06 | 72.02 | 69.30 | 58.31 | 81.14 | 90.64 | 97.26 | 63.72 | 69.90 | 75.10 | 100.01 | 84.42 | 80.80 | 71.43 | 68.03 | 74.46 | 61.72 |                        |

## METEOROLOGICAL RETURNS.

## RAINFALL RETURNS, DOMINICA. 1921.

| Station.             | January.    | February.           | March.     | April.   | May.     | June.         | July. | August. | September. | October. | November. | December. | Total. |
|----------------------|-------------|---------------------|------------|----------|----------|---------------|-------|---------|------------|----------|-----------|-----------|--------|
| Bagatelle, Soufriere | 4.72        | 2.15                | 3.46       | 3.41     | 2.26     | 3.08          | 10.11 | 12.31   | 7.56       | 10.88    | 4.88      | 7.36      | 72.18  |
| Batalie              | 4.05        | .56                 | 1.55       | 1.47     | 1.10     | 1.02          | 7.72  | 6.74    | 5.19       | 8.76     | 2.00      | 4.81      | 44.47  |
| Belleve              | 13.72       | 6.71                | 10.78      | 9.35     | 7.40     | 6.45          | 24.25 | 18.52   | 14.11      | 25.80    | 12.53     | 16.16     | 44.47  |
| Blenheim             | 6.62        | 3.79                | 7.59       | 7.13     | 2.45     | 7.25          | 15.45 | 11.20   | 13.06      | 13.07    | 11.12     | 10.74     | 164.98 |
| Botanical Gardens    | 6.82        | 1.02                | 4.46       | 3.06     | 1.54     | 1.96          | 11.18 | 9.30    | 6.28       | 9.44     | 2.44      | 4.22      | 109.47 |
| Caneheld             | 7.40        | .95                 | 3.83       | 2.33     | 2.07     | 2.83          | 10.64 | 11.74   | 7.29       | 10.02    | 2.33      | 4.71      | 61.72  |
| Castle Bruce         | 5.62        | 3.59                | 3.20       | 1.77     | 4.27     | 3.48          | 13.76 | 10.95   | 15.04      | 21.15    | 11.33     | 15.42     | 66.14  |
| Everton              | 10.51       | 2.71                | 6.29       | 4.63     | 2.82     | 3.68          | 17.34 | 12.40   | 6.01       | 19.22    | 2.73      | 6.45      | 109.58 |
| Goodwill             | 8.10        | 1.08                | 4.78       | 3.97     | 1.82     | 2.20          | 12.52 | 10.60   | 6.72       | 9.75     | 2.73      | 4.77      | 98.02  |
| Governor             | 8.47        | 5.91                | 8.29       | 8.44     | 4.72     | 6.87          | 14.6  | 10.83   | 14.15      | 16.31    | 15.11     | 4.77      | 69.04  |
| Hampstead            | 5.58        | 3.79                | 4.69       | 5.48     | 2.31     | 6.13          | 12.48 | 8.13    | 10.92      | 10.42    | 7.38      | 17.88     | 131.24 |
| Hillsborough         | 5.75        | 2.01                | 4.43       | 2.60     | 2.08     | 4.12          | 15.49 | 12.08   | 7.38       | 11.97    | 3.96      | 9.86      | 87.17  |
| Indian River         | 9.19        | 2.68                | 10.06      | 6.35     | 3.10     | 3.87          | 13.63 | 11.25   | 7.84       | 11.74    | 11.79     | 8.63      | 81.00  |
| La Haut              | 8.12        | 3.13                | 4.77       | 3.68     | 2.17     | 3.20          | 11.35 | 7.95    | 8.33       | 9.80     | 5.00      | 9.07      | 100.57 |
| Lakeside             | 29.91       | 17.66               | 38.03      | 27.20    | 21.90    | 24.15         | 39.77 | 25.85   | 26.91      | 43.73    | 29.94     | 4.41      | 71.91  |
| Londonderry          | 5.53        | 2.86                | 6.80       | 5.11     | 2.24     | 6.11          | 12.24 | 7.22    | 13.24      | 11.76    | 8.85      | 35.55     | 360.60 |
| Melville Hall        | 4.11        | 3.52                | 3.56       | 4.44     | 1.88     | 6.21          | 12.76 | 6.64    | 12.42      | 8.52     | 8.82      | 10.26     | 92.22  |
| Moore Park           | 8.00        | 3.10                | 5.78       | 6.67     | 1.72     | 2.60          | 12.80 | 20.90   | 11.07      | 18.52    | 12.15     | 13.65     | 86.53  |
| Moore Bruce          | 8.06        | 1.61                | 5.51       | 3.64     | 1.82     | 2.71          | 12.25 | 11.18   | 6.21       | 10.47    | 3.57      | 18.40     | 116.71 |
| Picard               | 8.38        | 2.26                | 9.97       | 9.82     | 1.25     | 3.56          | 12.83 | 11.32   | 7.59       | 10.49    | 6.99      | 4.91      | 71.94  |
| Pie, Mulatre         | 6.96        | 2.85                | 4.83       | 3.68     | 2.41     | 3.98          | 10.40 | 8.56    | 11.27      | 17.73    | 12.25     | 6.86      | 90.29  |
| Rosalie              | 6.12        | 5.17                | 6.12       | 4.76     | 7.09     | 5.88          | 15.47 | 10.93   | 15.88      | 19.97    | 10.13     | 14.53     | 99.85  |
| Shawford             | 18.60       | 7.17                | 13.15      | 8.41     | 4.70     | 8.87          | 23.78 | 17.81   | 14.60      | 24.98    | 9.61      | 14.85     | 122.37 |
| Snug Corner          | 12.40       | 4.30                | 6.10       | 4.80     | 4.70     | 5.40          | 19.80 | 13.40   | 9.50       | 31.30    | 6.80      | 13.83     | 168.02 |
| Soufriere            | 3.25        | 2.34                | 4.69       | 4.39     | 1.94     | 1.40          | 14.16 | 12.00   | 8.21       | 11.26    | 2.89      | 7.55      | 127.40 |
| St. Arment           | 10.40       | 1.70                | 6.48       | 6.03     | 2.36     | 3.76          | 12.16 | 11.28   | 8.42       | 13.27    | 4.56      | 6.16      | 76.08  |
| Wall House           | 9.48        | 1.30                | 3.78       | 1.60     | 2.00     | 0.61          | 13.58 | 10.99   | 4.22       | 0.66     | 1.76      | 5.07      | 86.58  |
| Woodford Hill        | 4.21        | 2.90                | 7.62       | 4.90     | 4.81     | 6.28          | —     | 8.11    | 12.02      | 9.76     | 10.21     | 7.02      | 55.05  |
| Mean Rainfall        | 27 Stations | 15 Leeward Stations | 3 Windward | 3 Inland | 6 Lasoye | 104.48 inches | 78.15 | 110.60  | 231.20     | 103.89   | 78.15     | 110.60    | 231.20 |

## METEOROLOGICAL RETURNS.

## SUMMARY OF METEOROLOGICAL REGISTER KEPT AT BOTANIC GARDENS, DOMINICA.

| 1921<br><br>Months | Thermometer. |        |        |        | Relative Humidity. |        | Thermometer. |        | Barometer Corrected<br><i>Reduced to 32° Fh.<br/>and Sea Level.</i> |        | Rainfall.                       | Wind.   | Barometer<br>Corrected. |                 | Thermometers.  |        | REMARKS.                                                       |
|--------------------|--------------|--------|--------|--------|--------------------|--------|--------------|--------|---------------------------------------------------------------------|--------|---------------------------------|---------|-------------------------|-----------------|----------------|--------|----------------------------------------------------------------|
|                    | Dry          |        | Wet.   |        | Humidity.          |        | Max.         | Min.   | 9 a.m.                                                              | 3 p.m. | Average<br>per hour<br>per day. | Highest | Lowest                  | Highest<br>Max. | Lowest<br>Min. |        |                                                                |
|                    | 9 a.m.       | 3 p.m. | 9 a.m. | 3 p.m. | 9 a.m.             | 3 p.m. |              |        |                                                                     |        |                                 |         |                         |                 |                |        |                                                                |
|                    |              |        |        |        |                    |        | 9 a.m.       | 3 p.m. |                                                                     |        |                                 |         |                         |                 |                | 9 a.m. |                                                                |
| Jan.               | 77.7         | 78.7   | 71.8   | 71.2   | 75.2               | 66.0   | 85.5         | 68.0   | 30.12                                                               | 30.04  | 6.82                            | 2.3     | 30.18                   | 30.00           | 88.0           | 65     |                                                                |
| Feb.               | 78           | 79.9   | 72.0   | 71.6   | 72.1               | 63.4   | 87.1         | 67.7   | 30.11                                                               | 30.03  | 1.02                            | 2.0     | 30.18                   | 29.94           | 91.0           | 63.5   |                                                                |
| March              | 77.4         | 80.4   | 71.3   | 71.3   | 71.8               | 60.4   | 85.8         | 68.1   | 30.08                                                               | 30.00  | 4.46                            | 3.1     | 30.17                   | 29.93           | 90.0           | 65.5   |                                                                |
| April              | 78.9         | 80.9   | 71.9   | 71.9   | 68.1               | 60.6   | 86.3         | 67.7   | 30.08                                                               | 30.03  | 3.06                            | 2.1     | 30.16                   | 29.99           | 91.0           | 65.0   | Earthquakes<br>11th 9.20 p.m. sharp.<br>12th 11.0 a.m. slight. |
| May                | 82.2         | 84.2   | 73.3   | 72.9   | 62.0               | 52.6   | 91.4         | 70.5   | 30.05                                                               | 30.00  | 1.54                            | 2.3     | 30.11                   | 29.95           | 94.0           | 66.0   |                                                                |
| June               | 84.2         | 85.2   | 75.5   | 75.3   | 62.9               | 58.8   | 91.9         | 71.7   | 30.07                                                               | 30.01  | 1.96                            | 2.3     | 30.15                   | 29.97           | 94.0           | 70     |                                                                |
| July               | 81.8         | 83.3   | 75.6   | 75.6   | 72.1               | 65.6   | 88.9         | 72.1   | 30.10                                                               | 30.06  | 11.18                           | 2.2     | 30.17                   | 29.98           | 95.0           | 68.2   |                                                                |
| August             | 82.3         | 83.9   | 75.8   | 75.6   | 70.5               | 64.3   | 89.7         | 71.6   | 30.06                                                               | 30.01  | 9.30                            | 2.0     | 30.15                   | 29.96           | 92.0           | 70     |                                                                |
| Sept.              | 83.2         | 83.7   | 77.1   | 76.7   | 71.4               | 68.6   | 90.3         | 73.3   | 30.04                                                               | 29.98  | 6.28                            | 2.2     | 30.09                   | 29.89           | 94.0           | 70.4   | Very High Winds<br>on 8th & 9th.                               |
| October            | 81.6         | 82.1   | 77.0   | 75.7   | 78.0               | 70.7   | 89.2         | 72.5   | 30.02                                                               | 29.96  | 9.44                            | 1.9     | 30.08                   | 29.87           | 93.0           | 71.0   |                                                                |
| Nov.               | 80.9         | 81.6   | 75.1   | 74.8   | 72.6               | 69.6   | 89.0         | 71.2   | 30.05                                                               | 29.98  | 2.44                            | 1.4     | 30.15                   | 29.92           | 93.0           | 69.0   | Sharp shock earth-<br>quake 4.50 p.m. 22nd.                    |
| Dec.               | 79.3         | 80.9   | 73.7   | 73.6   | 73.8               | 66.7   | 89.0         | 69.8   | 30.04                                                               | 29.98  | 4.22                            | 1.9     | 30.09                   | 29.91           | 92.0           | 66.0   |                                                                |

Highest Maximum Temperature = 95° on July 13th, Lowest Minimum Temperature = 63.5° on February 14th.  
 Highest Barometer (Corrected) = 30.18 on Jan. 13th & 27th and Feb. 22nd, Lowest Barometer (Corrected) = 29.87 on October 14th.  
 Greatest Rainfall in 24 hours = 2.18 inches on August 10th.



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##### SUGAR INDUSTRY.

Seedling and other Canes at Barbados, 1900-4.

Seedling Canes and Manurial Experiments at Barbados,

|                    |                    |                   |
|--------------------|--------------------|-------------------|
| in 1903-5, No. 40, | in 1904-6, No. 44, | } price 6d. each. |
| in 1905-7, No. 49, | in 1906-8, No. 59, |                   |
| in 1907-9, No. 62, | in 1908-10 No. 66, |                   |

Seedling and other Canes in the Leeward Islands,

|                    |                     |                   |
|--------------------|---------------------|-------------------|
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| in 1903-4, No. 33, | in 1904-5, No. 39,  |                   |
| in 1905-6, No. 46, | in 1906-7, No. 50,  | } price 4d. each. |
| in 1907-8, No. 56, |                     |                   |
| in 1908-9, No. 63, | in 1909-10, No. 67— |                   |

Manurial Experiments with Sugar-cane in the Leeward Islands,

|                    |                     |                   |
|--------------------|---------------------|-------------------|
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Sugar-cane Experiments in the Leeward Islands,

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